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EAST EUROPE REPORT

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POLISH SOFTWARE FOR UCS COMPUTERS

Budapest SZAMITASTECHNIKA in Hungarian Oct 80 pp 12-13

[Article compiled by Janos Milcsak: "Polish Informatics Association: Software Packages for ESZR Computers"]

[Text] The basic goal of the Informatics Association of Computer Technology Enterprises in Poland is that the economic development of Poland should be accelerated by the economic use of informatics.

This work is aided by more than 6,000 computer technology experts and 52 computer centers (in which there are 80 medium and large computers including 24 ESZR [Uniform Computer Technology System] machines).

Its basic services are: designing computer centers; designing and programming information systems; initiating and operating systems; giving informatics advice; and general and special informatics instruction.

Within the framework of its own research and development work the Informatics Association works on the following themes: preparing basic software and preparing technological software.

Developed systems for the more important economic branches were prepared in the Informatics Association of Computer Technology Enterprises and these systems are operating in all basic guidance areas. In addition, using special computing systems, they do statistical processing, economic analyses and optimalization and engineering computations.

We will report on a few of the achievements in the area of new software preparation technologies.

RODAN

The RODAN data base management system is an implementation in the area of data base management languages of the 1971 reports of the CODASYL-DEGT committee and is an implementation in the area of data description language of the 1973 reports of the CODASYL-CCL. Its basic programming language is PL/I. A newly introduced storage description language, a language for auxiliary functions and a generator for direct user language represent an expansion of the possibilities of the two reports listed.

It works under the supervision of an OS/ES operational system and can be used on ESZR 1022, 1032, 1040 and 1050 computers and on the IBM 360/370 series.

The RODAN system is delivered in single or multiple packet versions. It is possible to use both versions also, which is supported by a remote data transmission monitor.

As compared to traditional technology RODAN decreases the time for planning the data base by about 25 percent and reduces the time for preparing and testing software by about 40 percent. Using a data base management system based on RODAN can reduce the burden on magnetic disk storage by about 50 percent.

SKYON

The SYKON conversational data base management system, used with a terminal network, makes it possible to retrieve from the data base very quickly the broad information of various cross-sections which is indispensable for the leadership of large economic organizations and industrial plants.

SYKON belongs to the class of so-called autonomous systems; its function is the management of formalized data bases. It provides the user a high degree of flexibility in defining the logical structure of the data. From the viewpoint of the information retrieval process the organization of the data base is based on the well known method of inverse files.

SYKON contains software tools which provide management of dynamic structures. Retrieval, processing and actualization of data can be done in both the conversational and batch mode.

The data base service module can be used in both the batch and remote access mode.

STEP

The STEP production guidance system is a combination of systems by virtue of which planning and programming work can be accelerated to a significant degree.

Using STEP for generation can produce user software which realizes production planning and guidance functions.

It consists of three groups:

--a production guidance software generation system to realize such basic functions as, for example, planning the priority of assignments, satisfying materials needs, supervising the priority of assignments, planning production capacity needs and supervising stockpiles;

--an auxiliary functions software generation sysetm to manage technical and organizational changes in production, the development of normative costs, etc.;

--a software generation system supporting an optional area of production guidance to assist in technical preparations for production and in the areas of employment and wages, materials management and management of fixed assets. The basic element in the STEP system is the programmed data base. This software is received in such a way that one can use special user languages and generating programs which work with these languages as a result of which user software is generated in the PL/I or ASSEMBLER languages.

Use of the STEP system significantly reduces the time requirement for designing and programming a user system.

SWIT

The SWIT textual information retrival system makes possible the systemization of user data, the storage of source data, the development of a data base and the retrieval of the desired information with the aid of parameters defined by the user. The system contains programs which check the correctness and compatibility of data going into the data base and it contains complete software for maintenance of the data base.

With SWIT one can retrieve the address words which are linked to one another but one can also write out the contents of the data base in the form of a bulletin on the basis of parameters provided by the user.

SWIT operates under the supervision of an OS/ES operational system and is prepared for users of ESZR computers and the IBM 360/370 series.

SYWIN

The SYWIN report generator prepared for batch processing generates programs in the PL/I language with the aid of a special program language on the basis of parameters provided by the user; the function of the programs is to retrieve and print out the desired information. More than 50 information queries can be realized in one program run.

Optional organization of the files is possible and they can contain various types of records.

The SYWIN compilation also contains special software for processing index sequential files. With these programs one can eliminate program writing in the case of files with index sequential organization.

This software (in the ASSEMBLER language) carries out the following functions: organization of index sequential files on magnetic disks; loading the data into these files from optional data carriers; reorganization of the files; and writing out the index sequential files on optional data carriers. The SYWIN system is designed to operate under the superviison of a DOS/ES operational system on ESZR computers.

SMS

The purpose of the SMS software management technological system is the documentation and storage of software. It can be used most efficiently to manage medium and large systems. Its functions are: to check the sequential versions of the modules, identifying the version serial number; to automatically store the parameters connected to the types of information (for example, the table format and the number of copies of documentation); and to provide the procedures for the language actualizing the software.

Every single actualization automatically results in a modification of every page in the desired format and number of copies.

The SMS operates under the supervision of an OS/ES operational system.

LPSERVIS

Use of the LPSERVIS program for handling linear program packages significantly accelerates the process of preparing data. The user only has to describe the problem in a language similar to a mathematical formulae and process it with the aid of the LPSERVIS programs. The result of the operation of the programs will be a card deck or a magnetic tape file which can be used as input data for LPS-360 programs.

Linear programming activity with the aid of the LPSERVIS program package can be compared to the activity of a system organizer at the time of formulating the task. LPSERVIS works under the supervision of DOS/ES or OS/ES.

APS

The APS program package represents the compilation of software which processes data obtained with the aid of the SMF program package. The task of the SMF program package is to prepare data for a definition of indexes pertaining to the functioning of the operational system, for defining software efficiency, for planning an expansion of the computer configuration, for the efficiency of user services and for an automatic determination of computer operating costs.

With the aid of programs belonging to the APS program package--using the data obtained by the SMF--new software can be obtained. The languages of this new software can be ASSEMBLER, FORTRAN or PL/I. The APS program package was prepared for an OS/ES operational system.

PATEST

The PATEST program package is a tool by virtue of which modular or structural programming work becomes more efficient. It makes possible the testing of individual modules, hierarchies and entire modular programs written in ASSEMBLER, COBOL, PL/I and FORTRAN. The program package generates testing programs and one can link into these the modules controlling the hiearchy. The modules to be tested need not be adapted.

The program package works under the supervision of a DOS/ES operational system.

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PROBLEM OF RADIOACTIVE WASTE DISPOSAL EXAMINED

Sofia SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE in Bulgarian No 4, 1980 pp 5-15

[Article by Academician Khristo Ya. Khristov and Scientific Associate Georgi Stefanov: "The Problem of Radioactive Waste and Environmental Protection"]

[Text] The headlong growth of the nuclear power industry is determining the shape of the second half of our century to a large extent. The advanced countries are formulating programs according to which the capacities of nuclear power plants will be doubled in about two to three years. According to data of the International Atomic Agency, issued in May 1979, there are 232 nuclear electric power plants in operation with an overall installed electric capacity of 117,761 megawatts; 219 reactors were under construction with an overall capacity of 200,330 megawatts; 131 reactors totaling 127,084 megawatts were in the advanced planning stage. In 1980 the share of AETs [Nuclear Electric Power Plants] in world electric power production equals about 25-30 percent; according to a number of forecasts, by the end of the century it will exceed 50 percent and may even reach 75 percent (1). The expansion of the nuclear power industry inevitably results in the increase of the amount of radioactive waste. The production of one megawatt per year (of electric power) yields an average of one kilogram of fission products which, even after 5 to 6 months, remains the source of thousands of active curies. It is anticipated that by the year 2000 the overall capacity of the AETs will be about 4,250-4,500 gwt and that, consequently, the overall amount of produced radioactive isotopes will reach about 4,500 tons. At the time of their processing this will correspond to about 2×10^{12} curies (4). Furthermore, as a result of various inevitable, controlled or uncontrolled leaks, waters from the special washing areas, shower installations, and others, every day each 1,000 megawatt installed capacity yields an average of dozens of cubic meters per day of average or low active waste water which, after treatment, are converted into 30 to 40 percent dry residue. Even though low active, the latter cannot be freely dumped, for it requires hundreds of years before it has lost its radioactivity. This arises, in its full size, the problem of the elimination and storage of all such matters, some of which are necessary and valuable with a view to their subsequent processing, while others may be unnecessary yet should be carefully handled, for they are produced in the course of a few hours or days yet their radiation, needed or unneeded, useful or harmful, goes on for years or centuries.

This is a problem of importance to us as well, for we have two power reactors of 480 megawatts each (electric power), two more are in their prestart-up stage, and plans call for the building of generating capacities for another 1,000 megawatts in Kozloduy. Such reactors will be built on the second site for nuclear power reactors along the Danube River near Belene. As we know, our country is small. It has no deserts or uninhabited areas where such waste could be processed and stored without particular safety measures. The problem is, to the highest extent, not only human and technical but scientific. Furthermore, it must be resolved urgently, for it is on the agenda.

The BAN [Bulgarian Academy of Sciences] and respectively, the Institute for Nuclear Research and Nuclear Power Industry, have the responsible assignment of collecting, rendering harmless, and storing or, more accurately, burying radioactive waste which accumulates in work with radioactive isotopes in various scientific, medical, or industrial laboratories. We have at our disposal the current RAO [Radioactive Waste] storage area. The storing of waste by a nuclear power plant is a far more complex problem. Nevertheless, the institute has acquired considerable experience and, with the help of the Ministry of Power Supply, a solution could be provided considered optimum in terms of our country. Work is already underway on this problem. The present article is a survey of the means for the solution of the problem proving that, even though difficult and complex, it is in no case insoluble.

The public would like to have guaranteed radiation safety and exclude from the biospheric circulation the materials obtained in the course of the nuclear cycle. A number of subjective difficulties are created by the higher attention paid to the problem of nuclear power safety and insufficient information as to its nature. The so-called "atomic bomb syndrome," experienced by the segment of the population which is either underinformed or disinformed adversely affects the development of the nuclear power industry. Examples of this exist in some Western capitalist countries (Austria, Sweden, Canada) where the implementation of nuclear power programs have been arrested because of lack of an adequately clear concept of the processing, safe storage, and removal of radioactive waste from the human environment (2, 3) but, essentially, as the result of circumstantial and speculative reasons.

As we mentioned, radioactive waste comes not only from the nuclear power and other industry but also as the result of a number of scientific research activities, medical diagnosis and treatment with radio-pharmaceutical means, defecoscopy and other industrial activities, in the extraction and processing of uranium ore, the production of special nuclear materials, and others. Radioactive waste contains virtually all the elements and a great variety of chemical compounds. They contain natural radioactive elements or elements which are the product of human activities. Radioactive waste may be gaseous, liquid, or solid. It shares the common quality, however, that no matter how long it is preserved, it will always be potentially dangenrous from the radiation viewpoint. This danger stems from the circumstance that with direct contact radioactive materials could trigger biological changes and, as mutagens, may cause biological damage in the future as well.

A basic fact related to radioactive materials is that there is no method for shortening the period of time during which a given isotope remains radioactive. A certain period of time is needed for it to decay as a stable element. Consequently, in order to protect future generations from potentially biological harm, we must isolate the radioactive waste (RAO) from the atmosphere and the human environment for long periods of time by including them into harmless stable substances.

The RAO problem is important and complex. Its solution demands a great deal of attention and competence. However, it is not insoluble. It is obvious that man who was able to release atomic energy will be able to cope with this problem which, after all, is simpler.

The grading of the RAO is most generally on their aggregate condition. They are classified into gaseous, liquid and solid. Furthermore, the RAO may be classified on the basis of their chemical activeness and radioactiveness. These parameters determine the conditions under which the RAO could be processed and transported for storing, i.e., for their final safe treatment through burial in suitable geological formations.

The nuclear reactors and the plants processing exhausted fuel are the basic sources of gaseous RAO within the nuclear power cycle. The long-living gases krypton-85, carbon-14, tritium and iodine-129, which are the products of the fission of nuclear fuel are of substantial significance. As the programs implemented by the nuclear power industry increase, the quantity of such long-lasting isotopes in the environment will be rising steadily.

A similar situation prevails with liquid and solid RAO produced by nuclear installations and systems. According to Western forecasts by the year 2000 the projected quantities of RAO will be as follows:

- United States: 1.1 billion liters of liquid RAO with total activeness of 6×10^1 million curies (6) and about 1.5×10^5 cubic meters solid RAO (7);

- Sweden: 1.5×10^5 cubic meters solid RAO with total activeness of 2.5×10^3 million curies (8);

- Italy: 3.4×10^5 cubic meters (9), and so on.

As we may see, the volume of RAO is considerable for which reason we must consider it more carefully. Yet, as we said, there is no shortage of solutions. The problem is partially alleviated by the fact that strongly active substances are usually short-lived while those with a long life have low radioactivity.

In terms of radioactivity, these materials may be divided into three categories: low, average, and highly active. These terms have been used since the 1950s as indicators of how to handle RAO and how to process and treat them under specific circumstances. The term has the same meaning today as well, even though the quantitative and qualitative differentiation among the three categories in the different countries and even within a single country varies (10, 11). In the United States and France, for example, the upper limit of low radioactive waste is 10^{-6} curie per liter; in England and the USSR it is 10^{-5} power; in Belgium it is 10^{-4} . The upper limit of average activity waste in the United States, Britain and the USSR is 10 curies per liter; it is 10^3 curies in Belgium and France. Wastes with a higher radioactivity are included in the category of highly radioactive waste.

Of late the idea has been accepted to grade the RAO quantitatively on the basis of radioactivity. However, a number of objections exist concerning the quantitative definition of these terms, for the work and effect of one curie of strontium-90 are not the same as the work and effect of one curie of plutonium. In turn, it is not identical with one curie of tritium. Generally speaking, the different radioactive isotopes require different handling. Furthermore, the definitions of low, average, and high radioactivity waste cannot be the only criterion from the viewpoint of the physical foundations of radiation safety in their use, transportation and removal from the human living environment. The RAO are complex and most varied substances which cannot be characterized with one or two-three parameters. Nevertheless, the terms "low radioactivie," "average radioactive," and "high radioactive" are understood in their broad meanings by the specialists and those involved in the processing and storage of RAO.

The radiational threat of most isotopes requires their isolation from the biosphere for hundreds or thousands of years. As early as the 1950s the following system for RAO treatment was suggested and generally adopted: filtration of gaseous RAO, concentration of liquid RAO through evaporation and the pressing or calcination of the former in sufficiently small volumes, and the burial of both in suitable geological formations. Such formations must have a proven stability of salt-containing seams as would be the case, for example, with exhausted salt mines (the existence of salt which is easily soluble is an indication of the absence of groundwater which might eventually spread radioactivity).

The nuclear power industry has adequately effective methods for the treatment and storage of RAO. Some Western countries (Britain and others) have tried the system of putting radioactive materials in concrete blocks which are dumped to the bottom of the ocean. This decision is not considered efficient because of the aggressive nature of the sea water. Furthermore, concrete is permeable and is not very stable. Some authors have suggested that the RAO be launched into outer space. Outer space is boundless and would have space for many objects useless to us. It is obvious, however, that it would be barbaric for this great achievement of man--the reaching of outer space--to be spoiled by such unseemly actions. Unquestionably, the most natural method would be for each country to bury the waste in its own territory in stable geological formations which are not in short supply. The best solution, however, which may differ according to circumstances is still not believed to have been found, for which reason intensive scientific work is going on in the following directions: First, the extraction and concentration of radioactive isotopes; second, their blocking--their placement within stable solid blocks of cement, glass, bitumen, and others; third, their placement (burial) in suitable underground areas thus insuring their definitive removal from the human living environment.

Treatment of gaseous RAO. The current method used for the treatment of gaseous RAO are developing according to the nature and composition of the gas flow released by the ventilation stacks. Usually, new technological processes are used for the capping and removal of some radioactive gases such as krypton-85, such as kryogenic distillation, hydrofluoric absorption, adsorption, diffusion, or the utilization of selective membrane filters.

There are two basic methods for capping radioactive iodine: holding it on solid sorbents (metal exchange zeolites) or its inclusion within liquid substances. Thus, for example, some plants which restore worked out nuclear fuel use the technology of basic scrubbers (alkali-saturated water) capping the iodine in the solution. Some countries use amorphous substances processed with silver and silicic acid to eliminate the iodine from the gas flows.

Recently, particular attention has been paid to tritium because of its relatively long life (a half-life of 12.4 years) and because it is a basic component of animate matter, for which reason its presence in the biosphere is particularly harmful. Some isotope concentration processes are used for the treatment and removal of the tritium from water waste. Methods have been developed in the United States for catalytic exchange, hydrophobic catalysis, and others. Water and hydrogen distillation methods and enrichment with the help of reverse electrolysis are used as well.

Treatment of liquid radioactive waste. Large quantities of low and medium-active liquid RAO accumulate in the course of the operation of AETs. A 1,000 megawatt AETs produces annually up to several tens of thousands of cubic meters of water with increased radioactivity of $10^{-3} - 10^{4}$ curies per liter from the flow of the first cycle and $10^{-8} - 10^{-9}$ from the special washing, whereas normal water has a radioactivity of 10^{-13} while the admissible norm is under 3×10^{-10} curies-liter. Such waters cannot be released in the environment or be retained. As a result of intensive scientific research conducted in a number of countries sufficiently reliable methods and technologies are being developed and improved for the treatment and for rendering harmless liquid RAO so that the radioactive isotopes contained in the waste could be concentrated in small volumes and the treated waters may be used in a closed cycle by the enterprises themselves or released in open water reservoirs if the proper norms have been attained.

The methods and technologies for the processing and rendering harmless the low, medium, and high radioactive solid and liquid RAO vary considerably, as we shall see.

Low radioactive liquid RAO. The following methods and technologies are used in processing such RAO: coagulation, based on the method of combined precipitation of water oxides of radioactive isotopes together with the water oxide of the added precipitation metal; ion exchange using a system of ion exchange filters; distillation--concentration through evaporation in special evaporation systems and the treatment of the waste as highly radioactive, and so on.

Research on the treatment of low radioactive liquid RAO is focused on the further improvement of such methods and on reducing their cost. Let us point out as an example that in the distillation method the cost of evaporation per cubic meter has been reduced to 2.5 rubles (4). Research is underway to develop technologies for reducing the volume of the concentrate through freezing, the treatment of vapors from droplets obtained in distillation, the selection and use of suitable organic and inorganic sorbents, the development of methods and technologies based on essentially new processes for the processing of liquid RAO, and so on. Efforts are being made to develop technological systems based on the principle of electrodialysis and the extraction of radioactive isotopes from the solutions with the help of ion flotation.

High radioactive liquid RAO. In this case particular attention is paid to their safe removal from the biosphere for long periods of time. Experts in RAO agree on the satisfactory nature of the following method (12):

Intermediate storage in liquid form;

Hardening and wrapping of the waste;

Preservation of solid waste through technical means;

Storage (burial) forever in geological formations underground or under the bottom of the ocean.

Other alternate strategies are possible as well. Not one of them, however, has so far convincingly proved its advantages.

Treatment of solid RAO. A number of countries are working on the development of methods and technologies for the safe storage of this category waste, based on the principle of solidification with bitumen (13), cement (14) or glass (15). In the case of bitument solidification the radioactive waste which, naturally, is mixed with a large quantity of inert substances, difficult to remove, are ground into dust and mixed in melted bitumen (asphalt), after which the mixture is poured into thin-walled barrels where the bitumen hardens as it cools off. The main reasons for the interest displayed in the use of bitumen are: economy, smaller size per unit of measurement of solid RAO, relatively simple technology, good resistance of the end bitumen product, and, particularly, the low twisting and shifting of the enclosed radioactive isotopes. Possibilities are being studied to include in the bitumen a great variety of waste such as salt and hydroxide residue, concentrated liquid RAO (cubic residue), solutions, used and saturated ion-exchange resins, filtration materials, natural sorbents, and others.

Salts of liquid RAO may be injected into the bitumen in one of two ways:

1. Mixing the dry residue with bitumen after preliminary evaporation or elimination of the water from the solution.

2. Hot mixing of the solution (cube spaced residue, slime, bits, etc.) with melted bitumen and subsequent removal of the water through the evaporation of the product.

There are three basic bitumenizing systems for RAO: boiler-type bitumenizing reactors, verticle rotor bitumenizers of the mixer-evaporator type, and horizontal continuous mixers-evaporators.

Cementing, i.e., inclusion in cement blocks, is the second major technology used in the treatment of RAO. The advantage of this method is its relatively low cost and simple operational conditions. Its shortcoming is the insufficient durability of the blocks and the relatively high dilution of the radioactive isotopes they contain.

Calcification and glassing procedures are applied mainly with high-level radioactive waste. The purpose is for the finished solid form to meet specific criteria: It must be highly resistant to heat and radiation, combined with good heat conductivity and a high melting point. It must be mechanically solid and shock-resistant and have low dilution speed. Calcification is a process in which the liquid waste is evaporated to the condition of a dry product, i.e., turned into oxides. In glassing, the oxides obtained in the course of this process, mixed with flux (easily meltable components) are melted to the point of obtaining glass-like products.

However, a more extensive study conducted by American specialists (16) led to some worrisome conclusions according to which the glass-like mass obtained in the glassification of high-level active RAO is not a particularly stable matter: After a long period of stay underground, under the effect of water and air, its surface is partially destroyed and becomes soluble and releases a radioactivity of the RAO contained within it. Experimental studies were made in this connection and it was determined that boron silicate glass used for the solidification of the RAO begins to break down and to release radioactivity at 400 degrees. Furthermore, such a temperature may be reached in the course of the natural heating of the waste stored very deeply underground.

Temporary Storage and Burial of Used RAO

The building of a safe barrier against the negative influence of RAO radioactive radiation on the biosphere has provided a number of solutions to the problem of definitively disposing (burying) of RAO. Based on their economic possibilities, geographic and geological characteristics, demographic factors, and so on, the individual countries are developing their own approach to the removal of the RAO from the ecological system.

A clear distinction must be made between the concept of temporary storage and final storage or burial of RAO. The temporary storage means that further removal and transfer of RAO are necessary. In this connection installations for temporary storage are designed and operated in such a way as to facilitate the eventual transportation of the RAO to a suitable place. The final storage or burial means the final disposal of the RAO through their elimination from the human living environment without possibilities for subsequent extraction. In other words, it means storing them for an infinitely long period of time in a way to exclude any possibility for access to such waste.

The building of surface storage areas usually resolves only the problem of the temporary storage of RAO. The final storage, including that of long-life transuranium radioisotopes could be achieved also in special surface installations. Several basic concepts (17) have been formulated on the final disposal of RAO, as follows:

a. Final and definitive disposal on land in geological formations deep under the surface, below the ocean bottom, on the ocean bottom, or in icebergs;

b. Launching in outer space;

c. Transmutation processes converting long-life into stable or short-life isotopes.

Assessments of the time needed for the safe isolation of RAO usually call for about 1,000 years for the fission products and about 100,000 years for transuranium actinides. Initially, these periods may seem pretentious. In many parts of the world, however, they are within the limits of time periods for which geological events could be predicted with sufficient accuracy. At the present level of human technical possibilities the idea of isolating the RAO by enclosing them within solid masses or blocks with a view to their placement in various geological formations for final storage (RAO burial) appears the most feasible.

The basic requirement in assessing the suitability of geological formations as storage areas for the final burial of RAO is their ability to remove from the biosphere the radionucleides they contain until they decay to a safe level. In this case, the multiple-barrier approach calls for paying particular attention to the form and shape of treated RAO and the use of particularly durable containers, knowledge of the composition and chemistry of groundwaters, resistance of the artificial and natural barriers to the flow of water around the storage area, blocking the migration of radionucleides from the storage area to the surrounding geological strata with the help of various mechanisms (ion exchange reactions, filtration, sorbtion, and so on), artificial mechanisms and technical systems erected along the migration flow of groundwaters, and so on. Thick strata or diapyrite formations in rock salt are considered the most reliable geological formations for the final burial of RAO. Clay formations and solid (crystaline) rocks are another area to be studied and utilized as definitive storage areas (for the burial) of RAO.

Current Methods Used in RAO Processing and Storage in Some European Countries (12)

France. In France the problem of RAO treatment and storage is related to the broad spectrum of RAO products, ranging from low-level to high-level radioactive. The low-level and medium-level radioactive liquid waste is processed through cementing while the hard waste through pressing. The method of bitumen solidification or of including this type of RAO in molds of heat-resistant plastic is being used as well. After treatment the hardened waste is taken to the centralized storage area in La Hague. The high-level radioactive liquid RAO are glassified at the AVM plant in Marcoule, launched in 1978. A second such plant with an output of 18 kilograms of glassified mass per hour, obtained from the treatment of 40 liters of solution, is soon to be commissioned.

Since no decision has been made as yet as to the method for the final disposal of RAO the possibility is contemplated of the waste to be removed from the storage areas with a view to their further moving to their final storage area. In France the most promising method is considered to be the final disposal of RAO inside granite rock. The study of this possibility, however, is merely at its initial stage, for the factual requirement to use geological formations will arise between 1985 and 1990 along with the development of the nuclear power industry.

FRG. A characteristic feature of the FRG RAO disposal program is the development of a second combustion cycle and the final burial of RAO in the geological formations of the Asse Salt Mine. Liquid RAO are treated through mechanical filtration, evaporation and ion exchange, while solid RAO are hermetically sealed within 200-liter steel drums.

Cementing and bitumenizing are the practical methods used in hardening. The FRG is intensively developing mobile systems for waste solidification which could be transported from one nuclear power plant to another. The basic processes in such systems are cementing and bitumenizing. The solidification of RAO in plastic molds has been tried as well. The FRG uses two types of installation for the glassification of high-level radioactive RAO based on the PUREX and FIPS processes. PAMEIA, a third process, is under development. It calls for the conversion of phosphate glass into granules which are included in metal matrixes. The FRG is studying the use of iron ore mines and shafts in which to bury the RAO.

Czechoslovakia. The liquid RAO from the uranium industry are processed through ion exchange and co-precipitation. The shavings from the treatment of uranium ores are accumulated in special storage areas covered with dirt and vegetation. Liquid RAO from nuclear power plants are treated through filtration, ion exchange and evaporation. They are temporarily stored in reservoirs; they are hardened through vacuum cementing and bitumenizing. A film-evaporation rotary apparatus is used in the latter process operating at temperatures in excess of 150 degrees in which liquid RAO and the bitumen emulsion are poured. An industrial enterprise for RAO processing is under construction in Jaroslavskoe-Bohunice.

The RAO from nuclear power plants will be buried in waterproof storage areas close to the surface of the ground (no more than five meters deep) in Moravia and Slovakia.

The RAO generated by research centers, medical institutions and industrial enterprises are stored in limestone mines in the vicinity of Litomerice. Czechoslovakia has a storage area for the final burial of uranium industry waste near Jachymov and in an exhausted old uranium mine.

Hungary. In formulating their program for the processing of RAO, the Hungarian specialists take into consideration the fact that they will not have high-level radioactive waste. Technologies are being developed for the cementing, bitumenizing, and evaporation to dry substance of liquid RAO using hot air. Particular attention is being paid to the method of evaporation and drying with hot air in special twin-wall steel containers. The dry residue of the containers is covered with cement and bitumen with a view to its underground burial. This treatment method is relatively easy and considerably less expensive than the others. However, it offers no advantages or special guarantees even in underground storing because of corrosion and other processes over a longer period of time. Treatment through pressing is contemplated for solidified RAO.

Hungary has built a central RAO storage station for waste from the use of radioactive isotopes from scientific, medical, and industrial activities. Presently, concentrates of processed liquid RAO are cemented and dumped in special storage areas.

GDR. Here the RAO treatment program is based on the concept of providing conditions for temporary storage in the vicinity of major RAO sources. A program and a technology have been elaborated for the treatment and burial of liquid RAO in deep geological formations (salt mines).

USSR. A number of methods and technologies are undergoing development and experimentation for solidifying through the hardening of low-, average- and high-level radioactive liquid and solid RAO. Possibilities are under study to inject low-level liquid RAO through deep drills in suitable geological strata, insulated from upper water-bearing layers by the waterproof clay formations.

Methods and technologies are being developed for the processing of low- and average-radioactive liquid RAO on the basis of such systems through coagulation with suitable chemical agents, ion exchange through organic and inorganic sorbents, evaporation in special systems and subsequent hardening in solid materials through cementing or bitumenizing. According to the Soviet specialists the safest and most economical method, at least for the Soviet Union, is that of storing concentrates of low-level radioactive RAO in cement blocks. Studies and experiments are being conducted to determine the resistance to radiation of various brands of cement with a view to using them in the construction of large trench-type storage areas on the surface. Intensive efforts are being made in the Soviet Union to develop technologies and technological systems for the bitumenizing of low- and average-level radioactive liquid RAO through the use of (chemical) reactors of the boiler type, used for mixing and evaporation, vertical blade mixers-evaporators, and others.

Since 1966 successful experiments have been underway in Dimitrovgrad (USSR) for the burial of liquid RAO by pressurizing them in deep wells in suitable geological formations (caverns), reliably protected from the dynamics of groundwaters (18, 19).

Studies are also underway on technologies for the hardening of high-level liquid RAO through glassification. Such experiments involve the use of highly productive technologies based on the two-step process which includes clacination (dehydration) in a boiling stratum and subsequent injection of the dry residue into phosphate or any other easily melted type of glass.

It is precisely the vast range of research involving the use of different methods and technologies for the treatment and storage of gaseous, liquid and solid RAO that is characteristic of Soviet science and practice today. Experience will be the best proof of the system which will be selected according to circumstances.

Research in the Bulgarian People's Republic in RAO treatment and storage. Long before a nuclear power industry was started in Bulgaria, the Institute for Nuclear Research and Nuclear Power Industry (IYaIYaE) of the Bulgarian Academy of Sciences had initiated research projects on ways, means and technologies for the treatment and storage of various liquid and solid RAO, including biological and inorganic. Since 1967 the IYaIYaE has had a national base for the treatment and storage of liquid and solid RAO from the use of radioactive isotopes in scientific research, medical diagnosis, therapy and industrial activities in Bulgaria. In connection with the deactivating of liquid RAO the institute developed a method and technology for the sorbtion of radioisotopes from liquid RAO using inexpensive and easily available natural sorbents (clinoptilolite and vermiculite) poured in bitumen containers. This is a convenient method for reliable underground storage. This original method is familiar to and acknowledged by the rest of the world as the Bulgarian "shell method" for the treatment of liquid RAO. Long studies have been made of the possibility to use inorganic sorbents of the zeolite type, available in our country in virtually inexhaustible amounts. These studies were the base for the method and technology developed by the institute with the active participation of specialists from the Kozloduy Nuclear Power Plant involving an experimental system for the deactivating of low-level radioactive waters from the special flushing system of the Kozloduy Nuclear Power Plant. A technology and a system for preliminary foam separation--treatment of liquid RAO from PAV [Surface-Active Agent], using the foam separation and further treatment method with modified kieselguhr, were developed as the result of the existence of considerable quantities--up to 500 mg per liter--of surface active agents (PAV) which adversely affect the sorbtion of radionucleides by inorganic sorbents. The modified kieselguhr is obtained through a technology developed by the Institute for General and Inorganic Chemistry of the Bulgarian Academy of Sciences. The installation which includes systems for preliminary foam separation of the PAV and the ion sorbtion of radioisotopes on natural sorbents, operating on a semiautomatic basis, is undergoing experimentation in industrial conditions at the Kozloduy Nuclear Power Plant with a view to its application in 1980.

Bitumenizing is one of the basic and widely applied methods for the treatment--injecting into solid material--of liquid RAO, i.e., of the concentrate (condensed residue) of such materials. A joint group from the institute and the Kozloduy Nuclear Power Plant is conducting research on optimizing the technology for bitumenizing liquid radioactive waste and concentrated cubic residues from the nuclear power plant using the boiler-type laboratory systems developed by the IYaIYaE and of the rotary-blade type used at the Kozloduy Nuclear Power Plant.

The question of eliminating the migration of radionucleides into nature and the human living environment through the underground storage of RAO is a determining factor in the choice of the technology used for their treatment. In this respect the bitumenizing of RAO is one of the most reliable methods. The institute has extensively studied the seepage of radioisotopes injected into bitumen blocks under the influence of groundwaters up to two meters below the surface. It has been proved that even under such relatively adverse conditions the seepage, i.e., the migration of radioisotopes from bitumen blocks is virtually nonexistent. Consequently, this important stipulation of reliability in the final burial of bitumenized RAO in suitable underground areas has been met.

The definitive treatment of the RAO through burial in suitable geological strata is the third step in the problem of the definitive safe disposal of the RAO. The storage areas which are built for the final burial must meet conditions of providing reliable storage for hundreds or thousands of years with adverse effect on the human living environment. The best such conditions are the worked out salt mines which are protected from the dynamics of deep or shallow water flows. Mine shafts of uranium and other ores are being studied and used for the same purpose.

Currently a group of scientific workers--engineers, chemists, physicists, geologists, geophysicists, physicians, and others--from the Institute for Nuclear Research and Nuclear Power Industry and the Unified Center for the Earth Sciences of the Bulgarian Academy of Sciences, the Ministry of Power Supply, the Ministry of Public Health, the Ministry of Mineral Resources, and the Committee for the Peaceful Utilization of Atomic Energy are engaged in preliminary geological, hydrogeological, and technological studies, with a view to providing reliable radiation safety in identifying suitable areas in Bulgaria for building a central storage for the final treatment and burian of RAO following treatment with foam separation, ion sorbtion, and bitumenizing or cementing.

The problems of the treatment, temporary storage and sanitizing with a view to the final burying of RAO are quite complex and varied. Unquestionable, however, they are within the range of current scientific and technical achievements. We can see that the problem is not one of seeking an unknown solution, for the solutions are known and are even quite abundant. The problem is to select a solution which, under given circumstances and at a given stage would be the most adequate for a given country. The definition of such an optimum decision is forthcoming and such problems will be clarified in the immediate future both globally as well as in our country. Unquestionably, such problems will be resolved in such a way that the RAO will have no adverse effect on human living environment today and in the future, nor would it be an obstruction in the development of large-scale power industry in the future--nuclear power in its three basic elements--heat neutrons, breeder reactors, and thermonuclear synthesis.

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5003 CSO: 2202

OVERCOMING SYNCHRONIZATION ERRORS IN ES 1022 COMPUTER

Budapest SZAMITASTECHNIKA in Hungarian Oct 80 p 5

[Article by Gyorgy Ruttkay: "Overcoming Synchronization Errors in the Switching System of the ES 1022 Computer"]

[Text] Our institute, the Construction Economics and Organization Institute, has developed and operates a regional computer network within the branch. At present the ESZR [Uniform Computer Technology System] members of the network are the following: four ES 1020 B's, three ES 1022 B's and one ES 1040.

The technical condition of the equipment is good, as is proven by the 1979 data on technical up-time: 88.2 percent (average) for the ES 1020 B's, 87.9 percent (average) for the ES 1022 B's and 88.8 percent for the ES 1040.

(Technical up-time is the ratio of annual connected machine time to the total time devoted to maintenance, repairs and the overcoming of faulty operation during the same operational period).

Even more reliable operation is held back by the frequent "system binding" or "hard-waits" which fortuitously but characteristically appear during load peaks. The user must take into consideration that the danger of a "hard-wait" increases in proportion to the running time of the job. Another unfortunate consequence is that the load peaks are also processing peaks.

A stop without the indication of an error necessitates a detailed analysis of the environment. In what follows we will describe the discovery and overcoming of such a concrete error phenomenon.

A Description of the Error

The operators noted that on the ES 1022 computers, in a multiprogram environment, a reading of the data error magnetic tape caused a central unit machine error. As a test, in the course of correction, we used as a sample task an example judged critical: We tried a PL/I translation in one partition and a copying of the data error magnetic tape in another partition. In the monoprogram mode the translation went perfectly while the copying indicated the reading error, in accordance with the requirements. In the multiprogram environment we found two types of error:

a. a parity error (RDOP) in the data registers for machine stop (TO) and operational memory in such a way that statically the parity of the registers is correct;

b. a closed micro-instruction chain from which one can escape only by erasing the system.

We did the experiment in the environment of a DOS plus POWER operational system but later, in the course of our experiments, we discovered that the error is independent of the operational system.

Going beyond the magnetic tape subsystem, the error also appeared in the magnetic disk subsystem where the discovery of the problem was aided by the technical test (DGSS) provided by Robotron for the ES 1040--the same error could be produced by the selection which tests the exchangeability of the data carrier.

The Error Environment

Of the two error phenomenon the magnetic tape error could be traced to the one described in point b.

In the second selector channel (the magnetic tape units operate here) the unit gave a so called "final state byte." A "final state byte" appearing as data in the interface contains a bit combination indicating "channel completed" and "unit completed."

Of the interface identifiers the logic level of the "select from channel," "peripheral operating" and "control from peripheral" (VBR-K, RAB-A and UPR-A) is high, from which it follows that there was an I/O break which would have to have been inititiated by the microprogram (SERVS) serving the selector channel. The fixed initial address of the SERVS microprogram can be filled if the control unit accepts the need for a break and authorizes the filling of the initial address in the address register of the microprogram storage. The fourth bit of the register blocking a microprogram break in the common channel has a high logic level and indicates that the SERVS microprogram is being executed. This condition blocks any other I/O microprogram break until it is completed or until it reaches a condition where it can be broken for a higher priority need. The SERVS microprogram does not figure in the error microprogram cycle despite the fact that the condition of channel control indicates that it does. The branch conditions of the microprogram develop in the channel so the flip-flop determining this has a high logic level also. Independent of whether processor or channel microprograms are running, the branch condition is a function of channel state. As a result it is possible for there to be a parity error in the data register of operational storage if, due to badly developing conditions, the RDOP register integrates the contents of the register for break requirements (GRP). A parity error appears in the data register independent of the parity of the units--in this case by chance.

To sum up: the cause of the error phenomenon is that the state of channel control indicates operation under the SERVS microprogram but this has not yet begun.

The error condition can arise in two ways: some other information overwrites the address register of microprogram storage in the address filling interval, or the fixed address is not filled.

Measurement can take place with an auxiliary circuit which, by removing from storage authorization for address filling, forbids the rewriting of the address register during the filling time. As a result of this the address register remains empty; thus during the authorization time for fixed address filling the information, that is the initial address of the SERVS microprogram, does not arrive. The phenomenon suggests a synchronization error. The error can be overcome by using synchronization impulses which deviate from the original ones and by logical transformation of the given circuit.

Operational Experiences

Our institute has found this same error indicator on the ES 1022 B equipment of Bulgarian and Soviet manufacture. The users did not notice the indicated error on the computers after modification. There has been no observation from which it could be concluded that the operation of the modified circuit would become critical under other circumstances. We informed the Bulgarian manufacturing enterprise about the error discovered and gave them the techncial documentation for the modification. We will be happy to provide domestic users of the ES 1022 computers with information about the details of the modification.

8984
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HUNGARIAN EXPERIENCE WITH ISDOS SYSTEM

Budapest SZAMITASTECHNIKA in Hungarian Oct 80 p 11

[Article by Mrs Lajos Ivanyos and Jozsef Kiss: "ISDOS--In The Eyes of the User"]

[Text] If the test of a pudding is the eating of it then the test of a program is the using of it. We began to work with the ISDOS system at the KFKI [Central Research Institute of Physics] in 1978-1979. We ran the 2.1 version of the program system on our ES 1040 computer under an OS operational system (this version was implemented by the SZAMKI [Computer Technology Research Institute]).

While becoming acquainted with the new program system the user came into contact for the first time with the user documentation. Detailed descriptions of the ISDOS were available in both English and Hungarian. This made a good impression. A brief description of the ISDOS of a survey character suitable for organizational or systems technology experts was lacking (and is still lacking). To make up for this we are forced to give a verbal explanation, demanding much time, before any ISDOS applications.

The compilation into an ISDOS model of orders for computer systems (requests for proposals) promised to be an interesting applications area. Domestic experience in the 1970's showed that in general enterprises and institutions ordered machines (configurations) from computer manufacturing firms when they knew at most the general outline of the tasks they wanted to use the configuration for; selecting and describing the tasks came only later. Every sign indicates that in the 1980's the Hungarian economy will reach the level where customers will order systems to solve concrete problems. A common language to formulate the task would be useful in the buyer-seller dialog. We used ISDOS to test the modelling of a delivery task. Our experiment was not entirely successful. We found two reasons for this. In the first place the ability of the purchasing firms to provide data (basic information about the task to be carried out) was not adequate and in the second place the concept set of ISDOS did not prove flexible enough. Despite this we are convinced that within a few years we could have a specifications language in this area which could be extended (with an expandable concept set).

As a second application of ISDOS we selected a task for which the existence of all necessary data was guaranteed in advance. We took as a base a fully developed system plan. The task was a business administration one; relatively few operations had to be performed on many types of data. Here we used ISDOS to collect the data and to disclose contradictions. We described the data to be found on the documents, the internal data imagined in the system plan and the origin of the data. The analysis of the data (documents) was handled well in ISDOS; the redundancies and contradictions come out as they are described or analyzed. In our opinion the present version of ISDOS can be used well for such an application.

We tried formulating with ISDOS the specifications of an existing program system. It would be good to have a computer tool for the specification of our real time tasks too. In these areas we were unable to use ISDOS. We found the chief problem in the fact that even in describing the information system we ran into the limitations of the PSL. We found that PSL offers very weak tools to describe the interdependencies of running conditions and tasks (system dynamics); it does support the formulation of sequential tasks (which can be processed in the batch mode).

It appears from the foregoing that the application os ISDOS is not going smoothly; most often it runs into serious difficulties. In our opinion three factors play a role in this:

--We are using a very old version of ISDOS (we could get only the 2.1 version through the SZAMKI although a 5.1 version exists); in general the concept set of this is not sufficient for a formulation of our problems;

--Everyone, we also, tended to expect miracles from ISDOS applications, namely that task formulation would be substantially easier, representing hardly any work; the experience was that you had to sweat as much with ISDOS as you would manually, but the result--the system plan, the analysis--was of better quality, more easily surveyed and more understandable to others (being in a common language) and subsequent modification was easier. (We should note that with the IPT method of IBM it was found that its introduction meant a decrease in output and only after a transitional period did those introducing the method reach performance higher than the original. This is a general phenomenon in introducing new methods and ISDOS is no exception.);

--We tried out ISDOS not only in its original applications area so many problems derived from this. It is much better suited to traditional business systems.

Despite all the extenuating circumstances the limitations of ISDOS are facts. Since we do not have another specifications system which can be run yet we think it is useful; it will help gain experience and learning. It was a strong limitation for us that some of its programs are of very great extent and run only on IBM compatible machines; the MSZR [microcomputer system] series is not available so the users of MSZR computers do not enjoy the advantages of their own machines.

On the basis of our experience we will be able to use for real tasks, for specification purposes, only an extendable specifications language which, if possible, can be implemented on MSZR computers too. We are informed that large computer implementation of an extendable specifications language (SDLA) is being developed at the SZTAKI [Computer Technology and Automation Research Institute]. Hopefully we will be able to test the SDLA soon (perhaps on an MSZR computer too).

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COMPUTER CONTROLLED PRODUCTION SYSTEMS NEARLY OPERATIONAL

Budapest NEPSZABADSAG in Hungarian 5 Dec 80 p 5

[Summary] A computer-controlled production system, probably unequalled in East Europe, is expected to become operational at the Csepel Machine Tool Factory in the near future. It consists of seven machines five of which are machine tools. There is also a 32-meter long supply line along which a robot will place work pieces. The M-6 machine tools will be linked to the computer in 1981. Introduction of the system is expected to triple productivity over parts of the factory which use conventional equipment.

Production at Csepel has been keeping pace with international standards. This has been necessary, because over half the factory's output goes to capitalist countries. These consumers demand machine tools which can become part of a prodcution line or else they require complete production systems. Thus the Hungarian factory has had to learn through its own experience how to put together such a production line and of what it should consists.

Currently four such or similar production line are being built at machine industry enterprises. In addition to the system of Csepel, one is being readied at the Machine Tool Industry Works (Szerszamgepipari Muvek); another at the United Electrical Machine Factory (EVIG), while the fourth is being installed at the Driving Mechanism and Painting Equipment Factory (Hajtomuvek es Festoberendezesek Gyara). Of these, the most extensive and exciting is the one in progress at Csepel. Upon its completion, 30-40 highly-skilled, much sought after horizontal lathe operators will be free to work elsewhere.

The computer program evolved for Csepel by the Computer Technology and Automation Research Institute (SZTAKI) of the Hungarian Academy of Sciences will permit the machines to operate as the need arises rather than in set sequence. In addition to SZTAKI, the Machine Industry Technology Institute and the Control and Computer Technology Institute of Csepel played important parts in devising the Csepel system.

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DESIGNING, DEVELOPING AIDS FOR MICROPROCESSOR DEVICES

Budapest MERES ES AUTOMATIKA in Hungarian Vol 28 No 10, 1980 pp 370-374 manuscript received 9 Jan 80

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[Abstract] Two development aids, developed at the Research Institute of Metrology and Computer Technology of the Central Physics Research Institute, are described. (1) The minicomputer-based development system aids in the development of devices assembled from modules of the MMPS (Multi-Micro-Processor System bus). Its memory (as well as that of the minicomputer) may be filled with the user program, and its content can be read out or modified; step-by-step execution of the commands is possible; the internal registers of the microprocessor can be read out and modified; and programmable cutoff points can be specified. The device may also by used for troubleshooting and the memory may be divided between the already completed user memory and the minicomputer memory. The final, checked user program may be entered in the REPROM or the PROM with the aid of the standard peripheral devices of the system. (2) The universal microprocessor development system (UMDS) employs the microprocessor itself as a component of the development system, using the principle of in-circuit emulation originally developed by INTEL. It features two microprocessors, one the so-called master unit and the emulating unit. The two units are separated by the system bus. One unit, based on the Z-80 microprocessor, has a central processor unit, RAM and ROM memories, a control module, and interfaces for the peripheral devices. This unit is used to write, improve, and translate programs, as well as to carry out PROM or FPLA programming, documentation, and so forth. The other unit, consisting of the emulator module (replaces the user's microprocessor, emulates the user's memory, and realizes the emulation of the user's input/output units), the condition module (states four independent conditions before starting the program), the event module (compiles and stores up to 256 40-bit events such as processor control signals, data and address contents, and hardware symbols), and the RAM memory (which is also used by the microprocessor), performs the actual tasks. Its software consists of the Editor, Assembler, File-handler, Debugging, and Utility programs. The system can be used effectively to develop and debug microprocessor-based systems of various degrees of complexity. Its modules may be interchanged, and its programmable emulation feature permits the simulation of the microprocessor, the memory, and the interface circuits of the user system. as well as provides autonomous program tracing and oscilloscope-starting pulses, so that it may be used to develop system hardware and software of practically any microprocessor-based system. The two aids described save designing and developing costs and time. Block diagrams and application examples are described to illustrate the operation and use of the aids. Figures 3; references 4: 1 Hungarian and 3 Western.

2542
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CURRENT OBJECTIVES OF SCIENTIFIC RESEARCH, DEVELOPMENT

Bucharest SCINTEIA in Romanian 31 Oct 80 pp 1, 4

[Article by Ion Teoreanu, vice-chairman of the National Council for Science and Technology]

[Text] Romania's 1981 unified plan for socioeconomic development, formulated in full concurrence with the decisions of the 12th Party Congress, assures a good beginning for the nation's entire economic and social development during the next five-year plan. The provisions of the plan start with the fundamental objective -- emphasized by Nicolae Ceausescu in his speech to the recent plenary session of the Central Committee of the RCP -- "of moving into a new stage of socioeconomic development which will bring our country into the new phase of intermediately developed country, will produce a new quality in all areas, and will shift from quantitative accumulations to a new quality of labor and life in all sectors."

It is evident that the growth rates for 1981 envisage a consolidation of this five-year plan's accomplishments by stressing all intensive, qualitative factors in all sectors of activity, thus assuring a dynamic, balanced, and efficient development of the national economy, particularly in the branches and sectors which derive the greatest value from energy resources and raw materials.

The fulfillment of these objectives depends directly on the elevation of scientific research to a new and qualitatively superior stage. In the unified national plan for 1981, the provisions concerning scientific research, technologic development, and the introduction of technical progress -- formulated under the constant guidance of Nicolae Ceausescu, secretary general of the RCP, Chairman of Romania, and under the direct and highly competent leadership of academy-member, Dr-Eng Elena Ceausescu -- have been conceived as an important starting point for the new five-year plan, closely bound to the essential needs of the national economy. The plan includes more than 2500 formalized topics of scientific research, technologic development, and introduction of technical progress, of which nearly 2200 are intended for the development and modernization of material production, in close correlation with the other sections of the plan, thereby creating the possibility for the provisions of production and investment plans to be fulfilled on a modern scientific and technological basis.

During 1981, approximately 95 percent of the total value of the new and modernized products which will be placed in fabrication, will be the result of domestic designs, eliminating a large portion of imported foreign knowledge. To this end, the formalized plan alone foresees the placement in production of more than 500 groups of materials and consumer goods, machinery, tooling, and installations, of approximately 160 new technologies, as well as the implementation of 65 systems of mechanization and automation. Moreover, a large number of objectives in scientific research, technologic development, and introduction of technical progress, which lead to the achievement -- as early as 1981 -- of new products and technologies, are included in the plans of ministries, and are not formalized in the unified national plan.

The plan contains a number of objectives for identifying and exploiting new natural resources, especially new coal and fuel shale deposits, and new geothermal resources; increasing the recovery factor in oil extraction; optimizing deep drilling and extending ocean drilling; and comprehensively exploiting volcanic tuffs, with zeolite tuffs in particular. In this respect for instance, greater use will be made of technologies for secondary and tertiary exploitation of crude oil in wells by applying the most modern processes, and particularly those that use micellar solutions and underground combustion. At the same time, technologies will be established for exploiting bituminous sands, a domain which is still lagging, the situation having been justifiably criticized by the secretary general of the party. With regard to volcanic and zeolite tuffs -- areas of great worldwide interest -- in which we have already achieved some success, research and utilization will be expanded in the chemical and petrochemical industry (catalytic systems, ionic exchange processes), in agriculture (as soil amenders and fodder), and so on.

Important objectives are also planned in the exploitation of new sources of energy. Unconventional sources -- solar, geothermal, and wind power, biogas, and others -- will be used in new areas of activity (construction materials, wood processing, the light industry, agriculture, constructions), contributing an energy of more than 300,000 tons of conventional fuel. Nearly 200,000 square meters of solar panels will be installed during 1981 alone.

A large number of objectives in the chemical industry, the metallurgical industry, machine construction, the construction materials industry, the light industry, and so on, are aimed at the development of new or modernized technologies, with a reduced consumption of materials, power, and fuels, with the most extensive use of domestic raw and other materials, and with the fabrication of products that are competitive in exportation.

In the chemical industry for instance, we will stress "low tonnage" chemistry, that is, the manufacture of highly processed products which are especially in demand by the aeronautical, electronic, microelectronic, pharmaceutical, dye, lacquer, and other industries, and which were mostly imported. For instance, solely by placing in operation six new catalyst production plants during the next year, which together will yield more than 11,000 tons, we will spare the country a currency effort of nearly 36 million dollars. Similar massive importation reductions, assessed at several hundred million dollars, will be obtained by the domestic manufacture of a great number of new, high-technology products, machines, tooling, instruments, and installations, as well as materials for various purposes, all of them the fruits of our own research.

Objectives of great interest are foreseen in the utilization of reusable materials. These concern primarily the exploitation of more than 7 million tons of metallurgical slag --from which some useful mineral substances in short supply will be extracted with existing technologies; the use of more than 1.5 million tons of thermoelectric plant ash in the cement industry and in constructions; and the recovery and processing of more than 100,000 tons of used rubber items and tires. Similar large tasks are envisaged for other categories of materials, such as some sub-products derived from technologic processes, plastic items, used mineral oils, household scraps, and leather scraps, all of them illustrating the increasingly intensive participation of scientific research and technical engineering in the solution of one of the major problems in our national economy: the utilization and introduction into the economy of all usable secondary materials.

The formulation of next year's plan has taken into consideration the provisions of the special plans drawn by the National Council for Science and Technology in collaboration with various ministries. This collaboration is also obviously necessary in the future for completing the proposed tasks. As the secretary general of the party has pointed out, the programs in the technical progress sector have not been fully fulfilled during the current five-year plan, because many of the achievements of research have not been introduced into production on time. That is why, during the period to come, research staffs and specialists in industry must collaborate more closely for the implementation of research results in production.

The responsibility for fulfilling these tasks, and for fully meeting the requirements of this important stage of our country's development -- characterized by a lower demand of material investments and a greater need of knowledge investment -- falls both upon the National Council for Science and Technology, and upon the decision makers in ministries, centrals, and industrial enterprises. As the secretary general of the party has stated, we will thus be able to consolidate that which we have achieved, become more competitive in the world, and derive better value from our available resources.

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NEW CENTER FOR RESEARCH ON REAGENTS ESTABLISHED

Bucharest BULETINUL OFICIAL in Romanian Part I No 100, 25 Nov 80 p 1

[Council of State Decree on the establishment of the Center for Scientific Research and Technological Engineering for Reagents, subordinate to the Central Institute of Chemistry]

[Text] The Council of State of the Socialist Republic of Romania decrees:

Article 1--As of 1 November 1980 the Center for Scientific Research and Technological Engineering for Reagents, with headquarters in Bucharest Municipality, is established subordinate to the Central Institute for Chemistry.

The Center for Scientific Research and Technological Engineering for Reagents is organized as a research unit, without juridical personality, as a component of the Dudesti chemical enterprise, with headquarters in Bucharest Municipality, and has as its object of activity the devising of technologies for the manufacture of chemical reagents with guaranteed purity, for chromatography and spectroscopy, with electronic purity, pure products for synthesis, used as intermediaries in the drug, cosmetic and dye industries.

Article 2--The Center for Scientific Research and Technological Engineering for Reagents is in branch group IV and compensation Level I will be applied.

Article 3--The necessary working cadres will be assured, in the framework of the plan for the labor force and the remuneration of labor of the Ministry of the Chemical Industry, approved for 1980, by transfer in the interest of the job from the Dudesti chemical enterprise and the Chemical-Pharmaceutical Research Institute with headquarters in Bucharest Municipality.

As the activity develops, the necessary working cadres and investment funds will be provided by the Ministry of the Chemical Industry by annual plans.

Article 4--The Center for Scientific Research and Technological Engineering for Reagents will carry out specific analyses and quality control for products currently being manufactured for use as reagents, and it will carry out works of technological design and provide blueprints for installations needed for the production sections and pilot sections in the Dudesti chemical enterprise.

Article 5--Annexes Nos 1, 2, 3, and 4 of Council of State Decree No 112/1977 on measures on the organization and operation of the Central Chemical Institute--

Icechim are supplemented with the addition of the "Center for Scientific Research and Technological Engineering for Reagents."

NICOLAE CEAUSESCU
President of the Socialist Republic of Romania

Bucharest, 21 November 1980

No 350

CSO: 2702

LASERS USED FOR TRANSMITTING INFORMATION

Bucharest ROMANIA LIBERA in Romanian 24 Nov 80 p 5

[Article by Virgil Lazar: "Communications by Laser"]

[Excerpts] At the second edition of "Napotehnica '80," the exhibition of technical creativity, opened recently in Cluf-Napoca, one of the displays which arouses special interest on the part of the public also illustrates a new performance of teaching cadres in the polytechnical institute in the locality who have utilized the technology and system of transmitting information by laser, the prime beneficiary being the Bucharest calculator enterprise. The achievement is the work of a collective composed of Prof Dr Arpad Kelemen, Lecturer Eng Dr Mircea Crivi and others. In connection with this new Romanian technology we asked for some details from Arpad Kelemen, dean of the faculty of electrical engineering. He told us the following:

"The achievement is that of the electrical engineering research laboratory and it represents a special success. We have experimented with the transmission of information by laser between the 'Intercontinental' Hotel and Casa Scinteia and the results have been good, as expected. As an immediate application, the system will be used in computer centers as a wireless connection between computers and terminals and in the future, because of its effectiveness and because of the fact that a large amount of data can be transmitted by this means and because of the fact that it does not need wires, it will have broader use. The Romanian premier in laser communications is based on a world premier achieved in our faculty by the realization of complex motors capable of acting with continuous current on the system, step by step, which permits the efficient and exact positioning of the laser wave launched in space.

"These universal motors which were presented this year at the world congress on electrical activation in Greece were the object of great interest. In the discussions, the participants stressed that we are in the forefront in regard to the achievement of such types of machines and the possibilities for using them. Indeed, the positioning possibilities offered by the universal motors created by the Cluj polytechnical institute have led our collectives to another important field: the construction of robots, a task they approached headlong, encouraged by the success of the laser wave. Soon, we will talk about robots achivated by universal motors which can position every movement in time and space."

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END

JPRS 77149

12 January 1981

East Europe Report

SCIENTIFIC AFFAIRS

No. 692

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12 January 1981

EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 692

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SOCIALIST COOPERATION IN MICROELECTRONICS DISCUSSED

Budapest HIRADASTECHNIKA in Hungarian Vol 31 No 9, 1980 pp 334-336

[Article by Jan Grzybowski and Jerzy Kucinski, Poland, SEP (Association of Polish Electrical Engineers)]

[Text] Aircraft manufacture and space research are among the most miraculous achievements of postwar developments. However, the growth of the electronics industry is of similar importance; as a matter of fact, its effects are felt practically everywhere and contribute to advancement in almost all sectors of human activity.

Today we find no area of life in an industrially developed society where electronics is not involved; the degree of saturation with electronics is rightfully regarded as a measure of the development of the economy.

In spite of a high degree of saturation with new technological processes, the electronics industry never ceases to grow. Without this growth, electronics cannot develop further. This applies particularly to microelectronics, which today is a symbol of the sophistication and degree of development of the electronics industry. An increasing percentage of the cost of electronic devices (presently 8 percent, and estimated to become 10 percent by 1985) involves solid-state devices, in spite of the fact that these devices become cheaper as time goes on.

Making major simplifications, we might say that the manufacture of solid-state devices is the function of five basic factors:

- Degree of training of personnel (qualifications)
- Levels of manufacturing technology and their basic conditions
- Supply of raw and other materials

- Availability of technological measuring devices
- Level of demand for the products.

The nature and extent of the availability of these five conditions differs in the various CEMA countries, thus making the degree of development of their solid-state manufacturing industries different. It may be stated that no CEMA country, except the Soviet Union, is capable of becoming a leader in microelectronics from its own resources alone. Nonetheless, the CEMA countries have serious work ahead of them, and they conduct a dynamic manufacturing and development activity in the field of solid-state devices.

The following are the basic difficulties of further development: problems related to the implementation of new manufacturing technologies, and the lacking base for the production of technological and measuring equipment, especially insofar as these concern the manufacture of LSI's. In these areas, it seems, a high level of development can be achieved only if we make joint use of the maximum accomplishments of the individual countries. These are not just high-faluting words; they express a need: more dynamic growth of the economies can only be achieved if this is observed.

Let us note that work has already started on the technological integration of the technologies of the individual countries, although by far not to the degree that would be desirable. We can cite three examples illustrating the successful cooperation among CEMA countries in the field of microelectronics:

- Cooperation between the GDR (RFT [Radio and Communications Technology]) and Czechoslovakia (Tesla) in the area of technological equipment;

- Division of the work between Poland (Unitra-Wemi) and Czechoslovakia (Tesla) in the field of development and manufacture of digital integrated TTL circuits;

- Division of the work between the Soviet Union and Poland in the development of the following products: low-power digital integrated TTL circuits, microprocessor circuits, and technological equipment for the manufacture of integrated circuits.

A CEMA decision was promulgated a few years ago concerning the introduction of a unified digital system and the development of a minicomputer system. The results of this collaboration are well-known today: we now have digital devices in the -2 series; preparation of digital devices in the -3 series is underway; and the development of the next-generation equipment of the unified system is in progress. This cooperation would be impossible for the creation of equipment without cooperation in the area of the components at the required level. A separate working group is engaged in the study of the problems related to this. Although it has been existence only for a short time, it has already accomplished much, for example it has developed the methodology of the development of the component base of digital technology, compiled the information concerning the new structure of informatics about the proposed list of components proposed for application, established recommendations for the development of new solid-state devices, and prepared many items of documentation concerning methodology, organization, and standardization.

It is desirable to establish a similar working group within the framework of the REP [expansion unknown] Permanent Committee. The task of this group would be the charting of the IC technologies developed in all CEMA countries, as well as the charting of the potential available in terms of technological facilities of the solid-state industry and measuring instruments. In our judgment, the present status in microelectronics in the CEMA countries represents a realistic base for the joint development of a number of products (such as microprocessor circuits, LSI-MOS circuits, circuits with Schottky diodes, TTL series, low-power TTL series, and others).

Some microprocessor systems are already under development in certain CEMA countries (some are already actually available). It would be desirable if these countries would specialize on the development of these systems with the goal of meeting the needs of all CEMA countries for them. But is is also necessary to develop new, highly complex LSI circuits and systems, making use of the technological potential and joint development. Among the MOS-LSI circuits, the most frequently used ones are microprocessor circuits, and also memory circuits, calculator circuits, and clock circuits.

Cooperation is possible in this area too (so that the needs of the other socialist countries can be met by the specialization of some).

The rapid growth of microelectronics, on which—in a broader sense—the electronization of the economies of our countries is based, makes it necessary to include in this program not only the cadres working in the electronics industry (engineers and technicians) but also those who utilize modern electronics in the various sectors of the economy. They must all contribute intensively. The scientific and technical associations of the socialist countries have a particularly important role to play here.

These associations must determine the strategy and the conditions of microelectronics development on the basis of specialized knowledge and institutional objectivism. Certain methods of social work to be performed in this area have already been discussed at the previous conference, which was held in Dresden. The forms of scientific and technological cooperation among the associations were also discussed there. Unfortunately, the program prepared at the conference in Dresden, which would have meant the implementation of the decisions reached, was not translated into actual practice. We have no full information concerning the activities of the individual scientific and technological associations; however, there are several signs to the effect that the work has started only in a few associations, and even there it is not continuous or comprehensive.

The Popov Institute in the Soviet Union has chosen as its primary activity the sponsoring of scientific and technological conferences, symposia, and seminars, as well as factory visits. The goal of these events is the exchange of information and the opportunity for consultations on problems encountered in the individual countries. Mention should be made of the annual lecture series on "Days of the Radio," in which problems associated with microelectronics often play a leading role. Participation of specialists representing the socialist camp has been considerable at the "Days of the Radio" conferences for some years. This refers particularly to members of the associations in the GDR, Poland, and Hungary; only one or two participants represent the other associations. Insofar as subject matter is concerned, the most interesting ones are the use of opto-electronic devices and measurement/control equipment (and systems). The Microelectronics and Solid-State Devices Section of the Popov society is particularly active; for example, it has sponsored a regional conference in the Uzbekian Soviet Socialist Republic on the subject of the use of microelectronics in agriculture and the light industries. According to the leadership of the Popov society, the level of the application of microelectronic technology in the economy is not yet satisfactory; thus, the Tenth Five-Year Plan stresses the goals concerning the development of this technology. In connection with this, the Popov society will stress in the near future the use of microelectronics in cosmic communications, the widening use of microprocessors, the use of microelectronics and optoelectronics in control engineering, and environmental protection. Special recognition is due to the strengthening of the relationship between the scientific and technological associations of the Soviet Union and GDR, as a result of which, for example, bilateral conferences and seminars are sponsored on problems of microelectronics.

Electrical engineers joined in the Chamber of Technology have formed an electronics section, where considerable attention is given to microelectronics as the basis of the growth of other industries and of energy savings. Special microelectronics consultation centers have been set up in ten major cities of the GDR. The first conference on microelectronics in the socialist countries was held in Dresden, in 1978. Unfortunately, only a few colleagues from the GDR participated in the second conference, which was held in Torun. This contrasts with the fact that approximately 300 delegates attended the Dresden conference from the host country (Poland).

For all practical purposes, the Association of Czechoslovak Electrican Engineers (CSVTS) did not participate actively at the present conference in Torun, nor did send information about their activities and achievements in the field of microelectronics. All we know is that there will be an international microelectronics conference this fall in Czechoslovakia. In our opinion, it is important to stress that it was in Prague where the scientific and technological associations of the socialist countries approved the resolution dealing with the sponsorship of joint conferences, of which the first was held in Dresden and the second one is presently held in Torun.

Activities related to microelectronics at the Energetics, Electrical Engineering, and Communications Technology Association of Bulgaria (HTC) are in its electronics section. In addition to sponsoring scientific and technological conferences, the HTC sponsors courses on the application of microelectronics, and also prepares training aids. Approximately 300 experts have participated in these courses during the last two years. This association has also developed the plan of cooperation with similar associations in the GDR.

The Scientific Association of Communication Engineering in Hungary participates intensively in subjects related to microelectronics both within the borders of the country and beyond. The HTE has sponsored an international conference on the use of microprocessors in the economy and on the possibilities of extending such use. At the request of the KGM [Ministry of Metallurgy and Machine Manufacture], the HTE has evaluated the long-range development plans for the electronics industry of Hungary. The HTE was an active participant at the first microelectronics conference held in Dresden, has cooperated closely with the Association of Polish Electrical Engineers (SEP) in the preparation of the second conference, and is represented with the largest group among the participants of the "Microelectronics '80" conference presently held in Torun.

A microelectronics section was established within the electronics department of the SEP. This section works intensively within its field and develops its activities further. It has prepared and sponsored numerous conferences dealing with the science and technology of microelectronics (for example: broadening the use of integrated circuits to promote the electronization of the economy, computer-asisted designing of integrated circuits, and so forth). The second "Microelectronics '80" conference of the socialist countries is presently in progress. The Tenth European Microwave Conference and the Fourth European Circuit-Theory and Designing conference will be held this September in Warsaw. It should be noted in this connection that this is the first time one of these conferences is held in a socialist country.

The SEP has developed and submitted to the relevant authorities several projects, all of which are important for the economy. They include:

- Proposals for the development of the solid-state industry;
- Proposals concerning the complex development plan of the electronics industry;
- Report-like document for the Eight Congress Committe of the Party on the status and development prospects of the electronic-component industry.

It can be seen that these projects submitted to the relevant authorities affected significantly the final decisions in the matters concerned, as it was expected by the activists within the SEP.

To celebrate the 60th anniversary of the establishment of the SEP, an exhibition with the slogan "Electricity - Economy - Society" was held in June 1979. This event, which was praised in political and economic circles, featured microelectronics.

Within the framework of the celebrations of the 60th anniversary of the establishment of the SEP, the editors-in-chief of the electronics journals of the socialist countries have met in Warsaw. At this meeting, the guidelines and extent of cooperation and information exchange were decided upon. According to the decisions, the journals will play an important role in the development of microelectronics by informing their readers on achievements in this field. For example, the second issue of the year 1970 of the Polish journal ELEKTRONIKA has been devoted to the "Microelectronics '78" conference held in Dresden, of which it published detailed reports. The issue of ELEKTRONIKA to cover the "Microelectronics '80" conference is also expected to be similarly detailed.

The SEP has sponsored numerous lectures and symposia, both domestically and abroad, dealing with microelectronics. It has also set up correspondence courses in electronic subjects, all stressing problems of microelectronics. This activity intensified to such a degree that an Electronization Consulting Bureau and a Committee on Matters Related to the Electronization of the Economy were ultimately established. These two institutions study primarily microelectronics and its applications in the economy.

Activists of the SEP and specialists delivered several lectures in Berlin on the use of microelectronics in consumer devices and motorized technology.

If we review the two years which have passed since the "Microelectronics '78" conference we find that although the scientific and technological associations of the socialist countries have sort of fulfilled their programs concerning the spreading of microelectronics in their respective economies, they have accomplished only modest progress in the field of cooperation. The associations have not performed the tasks they accepted at the microelectronics conference held in Dresden, concerning specialization of manufacture, cooperation, and evaluation of joint plans.

The number of socialist delegations attending the present conference (in Torun) characterizes the extent and intensity of the cooperation.

To deepen the cooperation which is needed in the field of microelectronics, we believe that one or two so-called round-table conferences each year would be useful. Only one or two participants from each socialist country should attend these. The subject matters would involve discussion and evaluation of selected subjects, and the formulation of recommendations or proposals for CEMA organs and countries.

We are sure that bilateral socialist cooperations would also very useful. We expect the understanding of our partners and their help in all steps we undertake toward the development of the microelectronics industry, as well as in all our activities aimed at developing our economies more intensively.

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CSO: 2502

ACTIVITIES AT NUCLEAR RESEARCH INSTITUTE IN REZ

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech May 80 pp 672-674

[Article by K.S.: "On the 25th Anniversary of the Existence of the Nuclear Research Institute at Rez Near Prague"]

[Text] The industrial development of nuclear energy and technology is characterized at the present time in the CSSR--as it is in the rest of the world--by the rapid pace of innovation, the successful implementation of which demands that the necessary attention be devoted to the development of a research and developmental base. The Nuclear Research Institute (UJV) in Rez, near Prague, is the largest research and development facility in the CSSR focusing on the peaceful utilization of nuclear energy. This past June it celebrated the 25th year of its existence. While in the past it has successfully conducted basic research in nuclear fields, at the present time it is successfully fulfilling tasks of an engineering nature with concrete, implementable results, through which it is actively taking part in the development of the Czechoslovak nuclear energy program and in the practical utilization of ionizing radiation.

The January 1955 decision of the Soviet Government to provide us, and other socialist countries as well, with wide ranging assistance in the establishment of an appropriate research base had a fundamental significance for the CSSR in the utilization of nuclear energy for peaceful purposes. Thus, by a decision of our government, the Institute of Nuclear Physics was created on 10 June 1955. It was renamed shortly thereafter the Nuclear Research Institute and incorporated into the Czechoslovak Academy of Sciences. The original incorporation of the UJV into the Czechoslovak Academy of Sciences determined the predominate focus of its activity on basic research, and its mission was to develop basic and applied research in nuclear fields and to educate specialists. In addition, it has also successfully contributed to several industrial applications of nuclear specialties, for instance in the production of cryogenic equipment and of selected radioactive pharmaceuticals, etc. It also participated in the construction of the first Czechoslovak nuclear power plant, particularly in the area of reactor physics and related areas. The gradual development of nuclear energy in the CSSR also urgently required the thorough and committed restructuring of the research and development program of the institute so that it is fully subordinated to the needs of the state plan. Therefore, a government decision divided the UJV of the Czechoslovak Academy of Sciences into three organizations:

The Nuclear Research Institute
The Institute of Nuclear Physics
The Laboratory of Radiological Dosimetry

The Nuclear Research Institute at Rez, near Prague, has been subordinated, since 1 January 1972, to the Czechoslovak Atomic Energy Commission, while the other two institutes have remained parts of the Czechoslovak Academy of Sciences. The principal content of their work, according to the new statute, is research in the area of atomic energy, which may be divided into two basic thematic fields: in the first place, in terms of extent and the importance of the results in applied research in nuclear energy, which at the present time is focused primarily on problems of the VVER type light water reactors, although problems concerning promising fast reactors are also being addressed. Although the tasks in the area of nuclear energy are of a long range character, the UJV is approaching them in such a way as to make immediate contributions to the national economy, and in such a way that the findings can be used in nonnuclear sectors as well. For instance, the completed, implementable result of the state task, "Fast Reactor Development in the CSSR" made possible the production and delivery to the USSR of a second steam generator of world class quality for the BOR-60 reactor, and provided a profit of Kcs 20 million for the producer.

Certification tests of the pressure vessel material of the VVER reactor, also conducted at UJV, made possible the beginning of the production and export of pressure vessels, at the same time that production costs savings amounted to 2 million foreign exchange korunas. The final utilization of the findings of nuclear flouride technology for the regeneration of rare metals and the production of synthetic diamonds represents an innovation of great importance in nonnuclear industry which contributed Kcs 8 million in 1979.

The second area which concerns the institute is research in ionizing radiation, including research and development of radiation technologies, radionuclidic preparations for medicinal and biological applications, neutron activation analysis, and semi-conductor detectors. In connection with these projects the institute also produces and supplies germanium semiconductor detectors and radioactive pharmaceuticals for the needs of the national economy and for export. The economic effects of these products are definitely not negligible, given that in this past year alone yields from these activities (detectors and cryogenic technology) represented Kcs 46 million, including foreign currency, while radioactive pharmaceuticals for improving diagnostic techniques in the health care system yielded Kcs 660 million. A part of the UJV capacity is utilized for work of a service character which could not be conducted without the use of several unique pieces of institute equipment such as the reactor, hot cells, and the like. In addition to these basic functions, institute activity includes other fields of work and specialized services, one of which is digital computing technology.

Having been built in a centralized way in the interest of fulfilling research and development projects, the facility also assures consultational activity during programming, organizes instruction in the area of programming languages, develops new programs, maintains a library of standard programs, and assures the economical operation of computers, their maintenance and systematic modernization. Since 1965, the institute has had at its disposal a GIER-4 computer of Danish manufacture which has performed extraordinarily well and puts out 7,400 operational hours per year. The reasons that this computer is still in operation may be found in its reliability, ease of maintenance, and especially in its excellent software outfitting. The ALGOL programming language is used almost exclusively, and its compiler is well adapted to the technical parameters of the computer. However demands for computing capacity grew steadily, and in view of the impossibility of purchasing a medium computer it was necessary to modernize the GIER-4 gradually and this was eminently successful thanks to the well-conceived projects of a team of technicians, mechanics, and employees of UJV. In spite of the three-shift utilization of this computer it has still not been possible to solve all of the assigned projects, and particularly those requiring high operational speeds, large internal memory capacity and high capacity external memory: therefore it was decided to purchase computer system of the JSEP series--the currently most advanced model -- the EC 1040 from the Robotron combine of the GDR. This computer was made operational in 1977, and its parameters make it an important assistant of the institute in the resolution of its demanding tasks: an operational speed of 380,000 operations per second, a 1,024 K-byte internal memory, 8 disc memories of 7.25 megabytes each, 6 magnetic tape units, and much additional peripheral equipment fill out this advanced system. For a further increase in the quality of the functioning of the computer center, 85 modernization tasks are planned for 1981 on the EC 1040 system, in addition to the construction of a terminal network extensive in terms both of the selection and preprocessing of data (for administrative purposes), and for the remote processing of data and the remote debugging and verification of newly developed programs (primarily for the scientific departments of the institute). Control computers linked up to research and development work in the field of reactor physics and technology are direct components of the experimental base (these are a Hewlett Packard 9600 E, HP 21 MX, CIS 3000, JPR 12, SMEP, and others).

The cited realities, and a number of others, were communicated to Prague journalists at a press conference in the UJV building in Rez, near Prague, a few days prior to the 25th anniversary of the institute by its new director, Engr Vasil Krett, candidate of sciences, the technical deputy, Engr Frantisek Kasak, and other personnel. A similar event took place several days prior to the ceremonial gathering of the whole UJV collective, which the president of the republic decorated "For Outstanding Work" for its role in fulfilling the demanding objectives of the Czechoslovak nuclear program.

Nuclear Research Institute panorama

Nuclear Research Institute workers

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CSO: 2402

TRANSITION FROM ANALOG TO DIGITAL TELEPHONE NETWORK--TECHNOLOGICAL REMARKS CONCERNING THE PROBLEM

Budapest HIRADASTECHNIKA in Hungarian Vol 31 No 10, 1980 pp 361-366

KLEINAU, Karl-Heinz, professor, Dr, Transportation College, Dresden

[Abstract] The major factors affecting the development of telephone systems--rapid advancement of LSI and VLSI technology in circuits and microprocessors specified by the customers, increased effectiveness of electronic data processing resulting from advancements in modular software and supporting software, and rapid advancement of light-conduction technology--are reviewed. Growth statistics indicate that specialized telephone-only (excluding telegraph and telex) systems will be required, and that they will have to be of the digital type to handle the expected volume. However, at the present time, full digitalization of a telephone network cannot be readily accomplished, especially not on the local branch network level. Special problems are created by the fact that voltage-level differences cannot be easily bridged, so that many subscriber devices would have to be replaced or considerably modified. Development is thus concentrated on batteries, overvoltage protection, ringing, signaling, coding, and hybrid functions. Much remains also be done in the area of reliability and availability.' Advancements in light-conduction technology indicate that major applications may be expected during the 1980's. The advantages of this technology are well known; they are both technological and economic. However, full conversion to light-conductor technology is farther in the future because of the investment costs involved and also because the vastly increased capacity resulting from pulse-code modulation could not be fully utilized for some time to come. Figures 9; references 17: 6 Western and 11 German.

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CATALOG OF 1979 COMPUTER PROGRAMS

Budapest HIRADASTECHNIKA in Hungarian Vol 31 No 9, 1980 pp 327-331

[Article by Dr Karoly GEHER, Institute of Communication Electronics, BME (Budapest Technical University)]

[Text] The summary presented below is a catalog of the computer programs prepared in 1979 for electronics. The program data were submitted by the leaders of the institutions involved upon request from the Institute of Communication Electronics, BME.

Following the established custom, we compiled programs concerning electronic devices, electronic circuits, communications equipment, and communication systems. The program catalog lists the programs in the order they were received.

The "Catalog of 1980 Computer Programs" will include those programs which are received by the Institute of Communication Electronics, BME (address: 1111 Budapest, Stoczek u. 2), by 31 January 1981.

Name of the program: ZEKE
Description: Testing by simulation of a system consisting of N servicers, a separate line of k(=0,...,K) length before them and a joint queue of m(=1,...,M) . Uses a Poisson input process, various service times, and smoothed sequencing.
Programming language: CDC 3300, SIMULA
Programmer: Mrs Ferenc Szentirmai, BHG FI [Beloiannisz Communications-Technological Factory, Development Institute]
Expert and the owning institution: BHG FI, Dr Geza Gosztony
Reference: Internal Technical Report 90110-234

Name of the program: POAS
Description: Modified version of the ZEKE program, with random sequencing.
Programming language: CDC 3300, SIMULA
Programmer: Mrs Ferenc Szentirmai, BHG FI
Expert and the owning institution: BHG FI, Dr Geza Gosztony
Reference: Internal Technical Report 99110-234

Name of the program: CREK
Description: Simulation of a M(M)n type mass service system with limited accessibility and loss, featuring the following service principle: up to k (k<n) servicing units are examined in cyclical sequence by the new demand; if no free one is found, it is lost.
Programming language: CDC 3300, SIMULA
Programmers: Gyula Csaszar and J. Attila Schuller
Expert and owning institution: BHG FI, Dr Geza Gosztony
Reference: Internal Technical Report 90110-84

Name of the program: GRAFILT
Description: Program packet for the designing and analysis of electrical circuits—primarily filters— for the GD80 GC graphic configuration. The novel feature of the programs is the utilization of interactive graphics for data entry and result display.
Programming language: GESAL
Programmers: Gabor Pronay and Tibor Thron and Laszlo Gefferth, BME HEI [Budapest Technical University, Institute of Communication Electronics]; Vilmos Kovacs and Tibor Tolnay-Knefely, MTA SZTAKI [Hungarian Academy of Sciences, Research Institute of Computer Technology and Automation]
Owning institution: MTA SZTAKI
Reference: GRAFILT user bulletins

Name of the program: RELDIS
Description: Examination of lifetime distribution on the basis of experimental data in the case where every test sample has developed fault.
Programming language: R 12, FORTRAN IV
Programmer: Gabriella Sugar, MIKI [Research Institute of the Instrument Industry]
Expert and owning institution: MIKI, Gabriella Sugar
Reference: "Statistical Analysis of Reliability Test Results of Electromechanical Components" by Gabriella Sugar and Denes Kauser; Relectronic '77 Conference publication, pp 597-605

Name of the program: Z 80 simulator
Description: Program system simulating the operation of the Z 80 microprocessor, suitable for monitoring assembler-level programs.
Programming language: R 10 PLM
Programmer: Tibor Ormosi, MIKI
Expert and owning institution: Tibor Ormosi, MIKI
Reference: Application manual

Name of the program: Z 80 cross assembler
Description: Compiler suitable for the modification of programs written in the assembler language of the Z 80 microprocessor.
Programming language: R 10 PLM
Programmer: Tibor Ormosi, MIKI
Expert and owning institution: Tibor Ormosi, MIKI
Reference: Application manual

Name of the program: SFQ
Description: From the measured values of the input signals of linear systems, determines the optimum parameters of the selected transfer weight function. Minimizes the square sum of the deviations of the measured and computed output values.
Programming language: FORTRAN IV, R 12
Programmer: Gabriella Sugar, MIKI
Expert and owning institution: MIKI, Dr. Tibor Soos
Reference: SFQ application description, 1980

Name of the program: INTEL 4040 simulator
Description: Program system simulating the operation of the INTEL 4040 microprocessor, suitable for monitoring the assembler-level programs.
Programming language: R 12 assembly
Programmer: Dr Tibor Soos, MIKI
Expert and owning institution: MIKI, Dr. Tibor Soos
Reference: Application manual

Name of the program: INTEL 4040 cross assembler
Description: Compiler, suitable for the modification of programs written in the INTEL 4040 microprocessor assembly language.
Programming language: R 12 assembly
Programmer: Dr Tibor Soos, MIKI
Expert and owning institution: MIKI, Dr Tibor Soos
Reference: Application manual

Name of the program: DDIG-1, digital filter transfer designing program
Description: P, T1, T2, C approximations, LP, HP, BP, BS domain.
Programming language: R 12 FORTRAN
Programmer: Dr Miklos Herendi, MIKI
Expert and owning institution: MIKI, Dr Miklos Herendi
Reference: Research report, December 1979

Name of the program: Graphic extension of AMPER-77 compiler
Description: Prepared for the programming of EMG-666, with added NE-2000 plotter. Commands: LLEFT, URITE, SFACT, WHERE, LOCATE, FACT, PLOTL, MARKER, NUMB, SYMB, LINES, AXIS.
Programming language: EMG-666 machine code
Programmer: Tibor Sziladi, MIKI
Expert and owning institution: MIKI, Tibor Sziladi
Reference: AMPER-77 manual

Name of the program: System to design active RC filters with DARC biquadratic resolution
Description: Supplement for designing basic subassemblies containing thin-layer resistors and chip capacitors.
Programming language: R 12 FORTRAN
Programmer: Dr Miklos Herendi, MIKI
Expert and owning institution: MIKI, Dr Miklos Herendi
Reference: Research report, December 1979

Name of the program: Debugger auxiliary program for programs written in the AMPER-77 measuring language
Description: Services: checking variables, their mofidication, line-by-line program execution, jump to any desired location, placement of STOP's, modification of the parameters of measuring automata during operation.
Programming language: EMG-666 machine code
Programmer: Tibor Veres, MIKI
Expert and owning institution: MIKI, Tibor Veres
Reference: AMPER-77 manual

Name of the program: MONITR
Description: Monitor module of the IPS-200 program system providing the control of the ICOMAT-200 LSI measuring system, which ensures the connection between the user's measuring program and the measuring system and enables the execution of the operator commands.
Programming language: MACRO
Programmer: Computer Technology Department, HIKI [Research Institute of the Communications Industry]
Expert and owning institution: HIKI, Peter Rozsa
Reference: User documentation of the IPS-200 programming language

Name of the program: EDI 200
Description: High-level, measurement-oriented translator program of the IPS-200 program system, which ensures the control of the ICOMAT-200 LSI measuring system.
Programming language: MACRO
Programmer: Computer Technology Department, HIKI
Expert and owning institution: HIKI, Peter Rozsa
Reference: User documentation of the IPS-200 programming language

Name of the program: IPS-11
Description: Program system ensuring the control of the ICOMAT-200 LSI measuring system; may be used as an autonomous program. Measuring programs may be designed and run, and the hardware of the measuring system may be tested with its aid.
Programming language: MACRO
Programmers: Peter Rozsa and Adorjan Szeles
Experts and owning institution: HIKI, Peter Rozsa and Adorjan Szeles
Reference: IPS-11 user documentation

Name of the program: IECSYS
Description: Ensures the handling of DEC-compatible interfaces under the RT-11 operating system in accordance with IEEE-488-1975 recommendation prepared for PDP-11 and TDA 1140 computers.
Programming language: MACRO
Programmer: Adorjan Szeles
Expert and owning institution: HIKI, Adorjan Szeles
Reference: IECSYS documentation

Name of the program: WRAP11
Description: Prepares the following for wire-wrapped units on the basis of the source list: wiring instructions with wire-length calculation and summation; connection list of the unit; input punched tape for a connection-checking device; check list.
Programming language: MACRO FORTRAN
Programmer: Istvan Kollar, HIKI
Expert and owning institution: HIKI, Istvan Kollar
Reference: WRAP11 user's manual, WRAP11 user description

Name of the program: ODTRT
Description: Debugging of MACRO programs written for PDP-11 computers.
Programming language: MACRO-11
Programmer: Adorjan Szeles, HIKI
Expert and owning institution: HIKI, Adorjan Szeles
Reference: User's manual

Name of the program: HK-LYUKSZA02P
Description: The program processes the integrated-circuit parameters recorded on punched tape, as measured by the ICOMAT 2 KF measuring automaton.
Programming language: FORTRAN IV or punched-card reader
Programmer: Agnes Rajk, HIKI
Expert and owning institution: HIKI, Agnes Rajk
Reference: -

Name of the program: ROMOS
Description: Function of the program: generation of the program masks of mask-programmed ROM circuits; testing of ROM and EAPROM circuits. The program prepares control tape for ICOMAT-2 and ICOMAT-110 measuring automata.
Programming language: FORTRAN IV and ASSEMBLER (ICL)
Programmer: Gabor Farkas, HIKI
Expert and owning institution: HIKI, Gabor FARKAS
Reference: User documentation for ordering TMS 8302 circuits

Name of the program: MAPHLA-1
Description: Used (1) to prepare simple integrated-circuit masks and (2) to generate mask-readable characters and texts (Mask and Photoplate Labeler)
Programming language: FORTRAN IV, ASSEMBLER (PDP-11)
Programmer: Gabor Farkas, HIKI
Expert and owning institution: HIKI, Gabor Farkas
Reference: -

Name of the program: TERMANAL
Description: Graphic-interactive program for calculating the stationary and temporally variable heat distribution of integrated circuit boards.
Programming language: SLANG-3
Programmers: Dr Vladimir Szekely, Pal Baji, and Marta Rencz (Mrs Kerecsen), Department of Electronic Devices, BME [Budapest Technical University]
Experts and owning institution: REMIX Radio-Engineering Enterprise, Dr Vladimir Szekely and Bela Szakacs

Name of the program: REZIDENS EDITOR
Description: Text editor for microcomputer containing the microprocessor 8080, capable of being placed in any memory-address domain of a two-kbyte ROM.
Programming language: 8080 ASSEMBLER
Programmers: Dr Kalman Tarnay, Dr Ferenc Massi, and Zsolt Koros, Department

of Electronic Devices, BME
Expert and owning institution: SZKI [Computer-Technology Coordination Institute]
Reference: Description of REZIDENS EDITOR for users

Name of the program: GRAFI
Description: Programming-language and processing program for drawing machines for describing any drawing for computer processing. It can be used for the preparation of the graphic documentation of manually or computer-designed printed-circuit cards.
Programming language: Columbus Fortran, Columbus Assembler
Programmers: Janos Cserno, Mrs Tibor Varadi, Gyula Vass, Arpad Vincze, SZKI
Expert and owning institution: Design-Automation Laboratory, SZKI, Janos Cserno
Reference: "GRAFI Programrendszer. Programozasi Kezikonyv" [GRAFI Program System. Programming Manual], available at SZKI, TAL [Design-Automation Laboratory]

Name of the program: Dimensioning of premagnetized coils
Description: The program dimensions premagnetized coils on ferrite or E core, or M and TM core, or M33 ferrite or other material.
Programming language: EMG-666 autocode
Programmers: Peter Pfliegel and Dr Janos Granat, BME-HEI
Expert and owning institution: BME-HEI, Dr Janos Granat and Peter Pfliegel
Reference: "Dimensioning of Premagnetized Coils With the EMG-666 Benchtop calculator"; scheduled for publication in HIRADASTECHNIKA

Name of the program: ISOA2
Description: Manufacture-simulation, statistical control, and expected wastage percentage of LC filters. Capable of being re-run from magnetic tape and multiple statistics preparation.
Programming language: ICL 4-70
Programmers: Gabor Enekes, Dr Jozsef Gaal, Dr Laszlo Gefferth, Dr Edit Halasz, Dr Gyorgy Pongor, and Dr Tibor Tron, BME-HEI
Expert and owning institution: TELEFONGYAR [Telephone Factory], Jeno Radvany, Laszlo Szente
Reference: Operating instructions, 1979

Name of the program: OPAL
Description: Optimum distribution of the investment fund destined for improving the traffic volume of hierarchic telecommunication networks on the basis of statistical network model.

Programming language: OS/8 BASIC, PDP 8e
Programmer: Gyula Sallai, PKI [Experimental Institute of the Postal Service]
Expert and owning institution: PKI, Gyula Sallai
Reference: PROCEEDINGS OF THE 9TH ITC No 628, 1979

Name of the program: ARDIS
Description: Cost optimization of telecommunication networks (number of levels, number of exchanges per level) on the basis of the statistical network model.
Programming language: OS/8 BASIC, PDP 8e
Programmer: Zoltan Papp, PKI
Experts and owning institution: PKI, Gyula Sallai and Zoltan Papp
Reference: "Cost Analysis and Optimization of Hierarchic Network Configurations" PKI Report, 1980

Name of the program: NESTRA'79
Description: Economic and technical assessment of possible traffic-control structures of the two upper levels of telecommunication networks, including the optimum traffic designing of the circuit clusters, in alternative or direct-path systems.
Programming language: OS/8 BASIC, PDP 8e
Programmer: Zoltan Dely, PKI
Experts and owning institution: PKI, Zoltan Dely and Gyula Sallai
Reference: "Traffic-Control System and Structure Designing" 1980

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MULTICOMPONENT DIGITAL FORCE, TORQUE METER FOR INTELLIGENT ROBOTS

Budapest FINOMMECHANIKA MIKROTECHNIKA in Hungarian Vol 19 No 10, Oct 80
pp 289-295

[Article by Karoly Fock, associate professor, Department of Process Control, BME (Budapest Technical University); Gyula Laczhazi, Dr, associate professor, Department of Electronics, BME; Gyorgy Antos, Dr, associate professor, Department of Process Control, BME; and Ferenc Zilahy, staff scientist, MTA-SZTAKI (Hungarian Academy of Sciences, Research Institute for Computer Technology and Automation). The authors have reported on an intermediate stage of this project at the IInd Industrial Robots Conference, held 26-28 June 1979 in Szeged]

[Text] The article describes in detail the major steps that have led to the design and construction of the force meter needed for the "wrist" of the arm of intelligent robots, consisting of six components. The study also considered "crosstalk." It details, at the block-diagram level, the electronic measuring circuit associated with the force meter, the individual steps of the analog and digital signal processing, and the function of the device generating a digital electrical signal in proportion to the force and torque components with a computer operating in the on-line mode.

Introduction

Industrial robot research today often involves the creation of systems capable of performing relatively complex tasks (such as assembly operations). Important facets of these studies, which involve considerable effort, are shape recognition and investigations aimed at measuring external forces bearing on the gripping organs of the robot, as well as sensing proximity.

In the course of these studies, major advancements were also achieved in the field of measuring multicomponent forces [1,2,3]. Multicomponent force transducers are often installed between the gripper and the arm (meaning into the wrist). The arm generates an electrical signal that is in proportion to the force and torque vectors bearing on the gripper in all spatial positions . This means that information becomes avaiable on the environment, the workpiece, and the parameters (such as the bolt-tightening torque) concerned.

Description of the Problem

In the course of joint studies carried out by MTA-SZTAKI and the Department of Process Control of the BME in the field of industrial robots, the need has developed to install a force and torque sensor into the wrist of a computer-controlled COROHAND type industrial robot (Fig. 1).

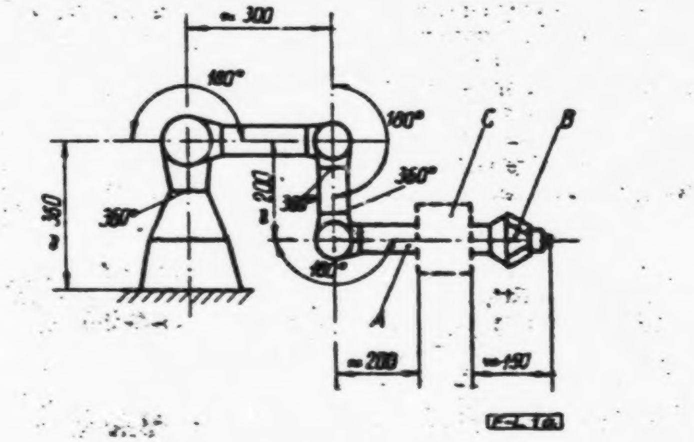


Fig. 1. a) Structural diagram of the COROHAND
b) COROHAND robot arm [photograph not reproduced]

Considering the functions of the robot and the development trends, we decided to develop a so-called six-component force meter [1,2].

Definition of the Task

The metrological task is to measure multicomponent force and to process the signals. The components F_x, F_y, F_z, M_x, M_y, M_z of the spatial F force and M torque vector (Fig. 2) bearing at the given point B must be determined simultaneously in the spatial coordinate system shown, and the electrical signals proportional to them must be made suitable for controlling the robot.

Starting Conditions

In view of the configuration of the gripper and the assembly tasks involved, the starting conditions for designing the force meter were the following:

- primary force (F) = 20 N
- primary torque (M) = 2 Nm, and
- h = 180 mm

(see Fig. 2).

In view of the complexity of the task, we decided that the permissible errors of the measurement may be higher than the errors customarily allowed in industrial force measurement [4], meaning that they may be in the order of magnitude of a few percents.

The relatively large displacement of Point B, meaning the value of the spring constant of the entire system being higher than customary in classical force measurement, is not necessarily detrimental since the relatively softer spring constant protects the transducer from major impacts when it collides with a foreign object.

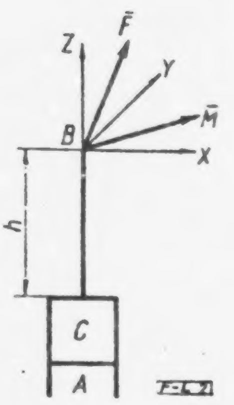
Since we lack applicable experience, we had difficulties in estimating the mutual effects of the individual components; however, we made it our goal to keep the effects at a low level.

It was also an understandable desire that the sensing should be independent of the moving speed and spatial location of the arm, insofar as the individual components are concerned; however, because of the lack of experience, we regarded this merely as a factor to be taken into consideration [6].

Designing a Six-Component Force Meter

Theoretical Fundamentals

The principle of the measurement of multicomponent force—irrespective of the design of the signal transducer—is the following: Let us assume that we desire to measure the effect of the force and torque vector in n different points and directions.



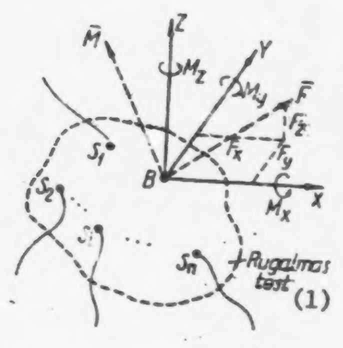


Fig. 2. Principle of the installation of the force meter
A - Robot arm
B - Gripping point
C - Transducer $|\overline{F}_{max}| = 20$ N; $|\overline{M}_{max}| = 2$ Nm; h = 0.18 m

Fig. 3. Measurement of multicomponent force
Key: 1 - Elastic body

An electrical signal S_i is generated in the individual points in proportion to the deformation caused (Fig. 3). Assuming elastic deformations, we find that the effects of the individual components are superimposed in these points, meaning that the relationship between the components and the electrical signals can be described by a linear equation system, so that the following applies:

$$\begin{vmatrix} S_1 \\ S_2 \\ \cdot \\ \cdot \\ \cdot \\ s_n \end{vmatrix} = \begin{Vmatrix} a_{11} & \dots & a_{16} \\ a_{21} & \dots & a_{26} \\ \cdot & & \cdot \\ \cdot & & \cdot \\ \cdot & & \cdot \\ \cdot & & \cdot \\ a_{n1} & \dots & a_{n6} \end{Vmatrix} x \begin{vmatrix} F_x \\ F_y \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ M_z \end{vmatrix} \qquad (1)$$

In view of the fact that the number of unknowns to be determined (F_x, F_y, F_z, M_x, M_y, M_z) is six, we need at least six signal-converting units ($n \geq 6$). The system of coefficients of the linear equation system describing the relationships among the measured signals and the components to be measured is called a coupling matrix in the literature. The coefficients of the coupling matrix express the effects of the individual components on the individual signal converters. In principle, each of the six components may affect each of the individual signal converters. In the ideal case, one coefficient is other than zero in each line of the coupling matrix.

To define the system of equations in a unambiguous manner, we must introduce the forces and torques bearing on the n selected points in a defined manner, and we must design the force-torque transducers in a proper mechanical manner. Modifying the earlier illustration (Fig. 4), we have in fact already sketched out the principle of the construction by realizing the transfer of force with the aid of the articulated bars marked E_i (decoupling bars). As the illustration shows, the individual sensors S_i obtain only force effects in the bar direction E_i since the bars are connected to the sensors in an articulated way, meaning to the part of the force/torque meter connected to the gripper. The sensors are fastened to a part connected to the robot arm.

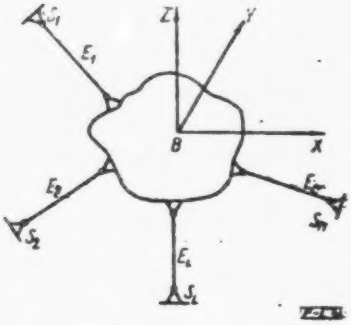


Fig. 4. Introduction of force and torque factors to the signal converters

Making the sensors, decoupling bars, and perhaps also the connecting parts of the same material is desirable from a metrological point of view (reduction of zero-point shifting); however, it is less so from the fabrication point of view [9].

In extension gauge resistor technology, it is customary to place the sensors on supports stressed to bending when measuring small force effects [6, 9].

Selection of the Design

To minimize the costs, we wanted to use the smallest possible number of sensors; thus, we rejected approaches involving the use of more than six sensors [1, 2, 3] right from the beginning.

Because of the fact that the force and torque vectors are very low in their nominal values, we felt that the introduction (transfer) of the force could be accomplished with thin cylindrical rods.

Reference [9] describes the approaches involving the use of decoupling bars (the possible layout of bars). The advantage of the approach illustrated in Fig. 5 is that the number of non-zero coefficients in the coupling matrix is relatively small [15] while the mechanical construction is relatively simple. (The illustration also shows some dimensions of which the importance will become evident later.) Decouplig bars are attached at defined points to the frame structure—which may be regarded as rigid—and these bars are connecting the frame structure to six spring-loaded measuring bodies equipped with elongation transducers. The frame is connected to the gripper of the robot (Point B), and the springs are connected to the robot arm (clamping of the console springs). The following is the system of equations describing the relationship between the forces bearing on the measuring bodies and the components $\overline{F}$, $\overline{M}$ (force-torque) — assuming that the measuring bodies obtain only bar-direction forces:

$$\begin{vmatrix} F_1 \\ F_2 \\ F_3 \\ F_4 \\ F_5 \\ F_6 \end{vmatrix} = \begin{Vmatrix} \frac{a+h}{2a} & 0 & 0 & 0 & \frac{1}{2a} & -\frac{1}{c} \\ \frac{a+h}{2a} & 0 & 0 & 0 & \frac{1}{2a} & \frac{1}{c} \\ \frac{h}{a} & 0 & 0 & 0 & \frac{1}{a} & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 \\ 0 & \frac{h}{b} & -\frac{1}{2} & -\frac{1}{b} & 0 & 0 \\ 0 & -\frac{h}{b} & -\frac{1}{2} & \frac{1}{b} & 0 & 0 \end{Vmatrix} \times \begin{vmatrix} F_x \\ F_y \\ F_z \\ M_x \\ M_y \\ M_z \end{vmatrix} \qquad (2)$$

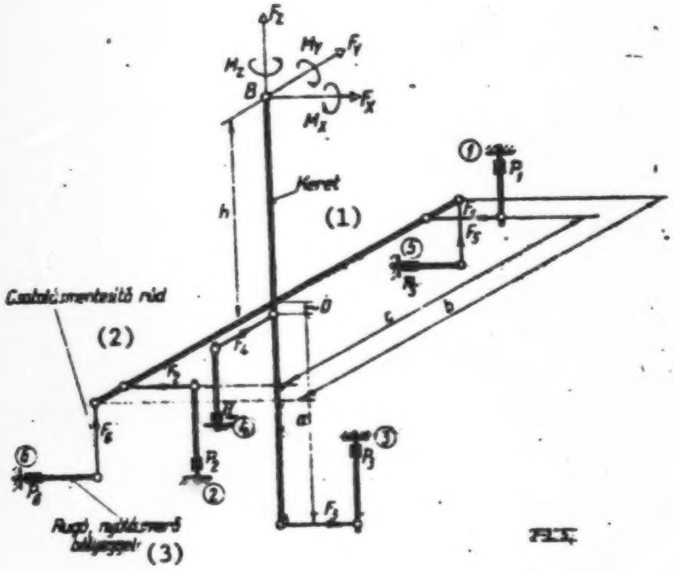

F_Z
M_Z
M_Y
F_Y
B
F_X
M_X
Keret
(1)
h
①
F_1
F_5
⑤
Csatolásmentesítő rúd
(2)
b
c
F_4
F_6
⑥
②
③
F_3
Rugó, nyúlásmérő bélyeggel
(3)

Fig. 5. Mechanical principle of the operation of the measuring head

Key: 1 - Frame
2 - Decoupling bar
3 - Spring with elongation transducer

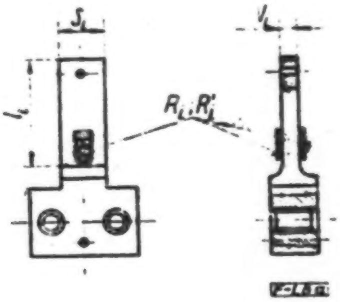

S_i
V_i
l_i
R_i; R_j'

Fig. 6. a) Sketch of the measuring bodies 1, 2, and 3
b) Measuring body installed in place
[photograph not reproduced]

Description of the Six-Component Force Meter Completed

Mechanical Construction

The connecting parts were made of aluminum. Insofar as the geometric dimensions are concerned, a = 40 mm, b = 90 mm, and c = 80 mm have determined the principal dimensions of the converter.

The measuring bodies stressed for bending were made of high-grade alloyed steel. The heat treatment and aging were carried out with great care. The measuring bodies with constant cross section and clamped at one end were joined with bolts; wherever this was feasible, we made them of one piece (Elements 4, 5, and 6).

We allowed a bending stress of up to 200 N/mm^2 in the individual measuring elements, and we allowed a downward bend of 0.1 mm for the measuring elements. (The latter value represents a compromise between sensitivity and spring constant.) The individual converters were designed for a sensitivity of 1 mV/V.

The size of the elongation transducer (4 mm by 7.5 mm) predetermined the minimum width and length of the measuring bodies.

Our goal was to design measuring bodies which are easy to manufacture; thus, we designed Elements 1, 2, and 3 as shown in Fig. 6, and the combined Element 4, 5, and 6 as shown in Fig. 7. (The illustrations also show the elongation transducer resistors and the photographs of the measuring elements also show the decoupling bars.)

The following are the maximum forces bearing on the measuring elements:

$F_1 = F_2 = 105$ N

$F_3 = 140$ N

$F_4 = 20$ N

$F_5 = F_6 = 722$ N

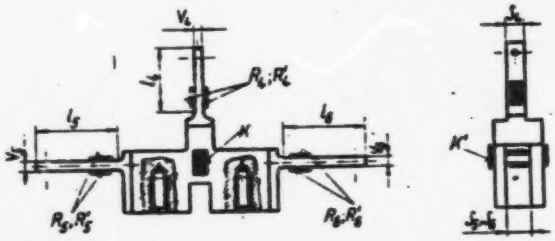


Fig. 7. a) Sketch of the measuring body 4, 5, and 6
b) Measuring body installed in place
[photograph not reproduced]

Table 1 shows the dimensions of the measuring bodies.

The decoupling bars were made of spring steel; both their ends were secured by electron-beam welding. An exception from this is Decoupling Bar 4, of which one end was attached to the measuring element with adhesive to facilitate assembly.

The decoupling bars were dimensioned according to the principle described in Reference [9]:

- we selected five-fold safety reserve, while using the thinnest possible bars of adequate strength, which did not buckle under compression;

- We exercised care to ensure that the force required to bend the decoupling bars when the measuring element deflects does not exceed one percent of the spring force of the measuring element.

Table 1. Geometric dimensions of the measuring elements

Measuring element	Length h in mm	Thickness v_i in mm	Width s_i in mm
1, 2	20	2.50	9.75
3	20	2.50	13.00
4	15	1.40	4.40
5, 6	20	2.50	6.70

The photograph of the measuring head (Fig. 8) allows us to recognize the components described so far on the basis of the sketch and the measuring elements.

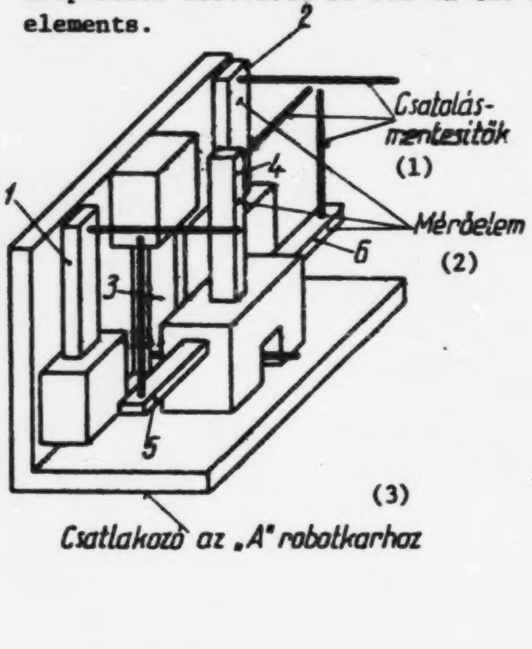


Fig. 8. a) Layout of the measuring elements of the force meter
b) The assembled force meter [photograph not reproduced]

Key: 1 - Decouplers
2 - Measuring element
3 - Connector to Robot Arm "A"

The following dimensions were obtained fot the decoupling rods (Table 2):

Table 2. Geometric dimensions of the decoupling bars

Decoupling bar	Length in mm	Diameter in mm
1, 2	30	1.5
3	30	1.5
4	30	1.0
5, 6	30	1.3

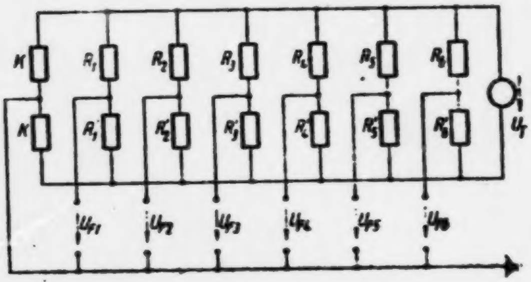


Fig. 9. Bridge circuit of the elongation transducer of the force and torque meter

Bridge Circuits With Elongation Transducer

We developed the full Wheatstone bridges (Fig. 9) with two active elongation transducers to reduce the temperature effects and to increase the sensitivity. We placed the "K" auxiliary measuring resistors on that part of one of the measuring bodies (Fig. 7) which practically does not deform.

Supply of the bridge comes from a highly stable U_T = 2.4 V, d.c., generator.

Evaluation of the Force-Measuring Head

We examined the force/torque meter in an experimental loading system. The apparatus permitted us to examine the effects of all three components of the force and the torque. We measured the output signals of all six transducers under all loading conditions.

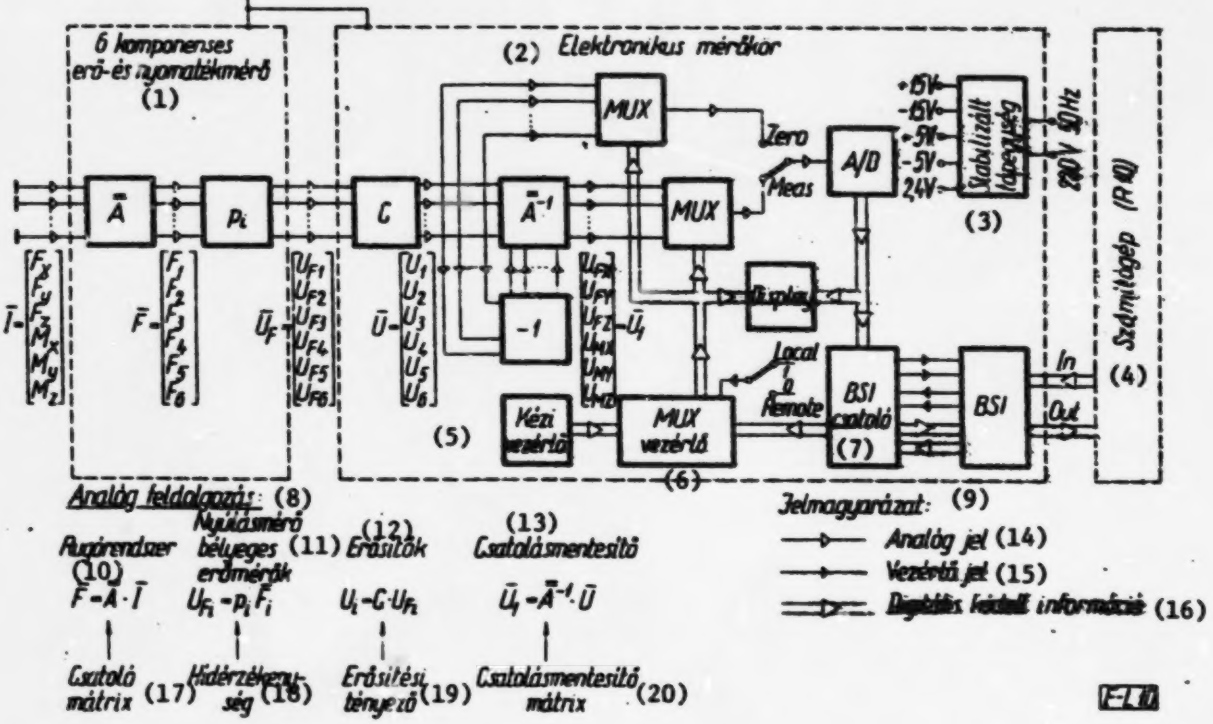

6 komponenses erő-és nyomatékmérő (1)
(2) Elektronikus mérőkör
MUX
Zero
Meas
A/D
+15V
-15V
+5V
-5V
24V
Stabilizált tápegység
(3)
220V 50Hz
Számítógép (R10)
(4)
In
Out
$\bar{\bar{A}}$
p_i
C
$\bar{\bar{A}}^{-1}$
-1
MUX
Display
Local
Remote
BSI csatoló
(7)
BSI
Kézi vezérlő
(5)
MUX vezérlő
(6)
$\bar{T}=[F_x, F_y, F_z, M_x, M_y, M_z]$
$\bar{F}=[F_1, F_2, F_3, F_4, F_5, F_6]$
$\bar{U}_F=[U_{F1}, U_{F2}, U_{F3}, U_{F4}, U_{F5}, U_{F6}]$
$\bar{U}=[U_1, U_2, U_3, U_4, U_5, U_6]$
$\bar{U}_1=[U_{FX}, U_{FY}, U_{FZ}, U_{MX}, U_{MY}, U_{MZ}]$
Analóg feldolgozás: (8)
Rugórendszer (10)
Nyúlásmérő bélyeges erőmérők (11)
(12) Erősítők
(13) Csatolásmentesítő
$\bar{F}=\bar{\bar{A}}\cdot\bar{T}$
$U_{F_i}=p_i F_i$
$U_i=C\cdot U_{F_i}$
$\bar{U}_1=\bar{\bar{A}}^{-1}\cdot\bar{U}$
Csatoló mátrix (17)
Hídérzékenység (18)
Erősítési tényező (19)
Csatolásmentesítő mátrix (20)
Jelmagyarázat: (9)
Analóg jel (14)
Vezérlő jel (15)
Digitális kódolt információ (16)
F-L10

Fig. 10. Block diagram of the six-component force and torque meter

Key: 1 - Six-component force and torque meter
2 - Electronic measuring circuit
3 - Stabilized power supply
4 - Computer (R 10)
5 - Manual control
6 - MUX control
7 - BSI connector
[Key continued on next translation page]

[Key for Fig. 10, continued from preceding page]
8 - Analog processing
9 - Explanation of symbols
10 - Spring system
11 - Force measuring units with elongation transducer
12 - Amplifiers
13 - Decoupler
14 - Analog signal
15 - Control signal
16 - Digital coded information
17 - Coupling matrix
18 - Bridge sensitivity
19 - Gain factor
20 - Decoupling matrix

The examination had two goals: first the better understanding of the principle of operation; second the trial of the construction approaches (such as the bolt-attachment of the measuring bodies) and the technological methods (such as heat treatment and aging). The selectivity of the measurement transducer is of vital importance for subsequent signal processing. We had to ascertain the degree to which the measurement transducer in fact follows the theoretical principle developed on the basis of simplifying assumptions (see Equation (2)). The problem was that there was no technological way during construction for the articulated clamping of the decoupling rods, so that crosstalk and nonlinearities had to be expected.

The invert version of the coupling matrix, the so-called decoupling matrix, had to be realized for signal processing. The closer comes the behavior of the measurement transducer to the theoretically derivable system of equations, the simpler will be the design of the signal-processing circuit, and the simpler and the more accurate will be the realization of the invert matrix.

In numerical terms this means that we must find out the extent to which the zero elements are indeed zero in the coupling (or decoupling) matrix. An answer to this question can be obtained by examining the decoupling matrix.

Using the symbols shown in Fig. 5, we assume that the sensitivity of the individual force-measuring bridges with elongation transducer is

$$p_i=\frac{U_{Fi}}{F_i} \qquad (3)$$

Equation (4) defines the theoretical decoupling matrix, derivable from Equations (2) and (3):

$$\begin{vmatrix} F_x \\ F_y \\ F_z \\ M_x \\ M_y \\ M_z \end{vmatrix} = \begin{vmatrix} \frac{1}{p_1} & \frac{1}{p_2} & \frac{1}{p_3} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{p_4} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{p_5} & \frac{1}{p_6} \\ 0 & 0 & 0 & \frac{h}{p_4} & -\frac{b}{2p_5} & \frac{b}{2p_6} \\ -\frac{h}{p_1} & -\frac{h}{p_2} & \frac{h+a}{p_3} & 0 & 0 & 0 \\ -\frac{c}{2p_1} & \frac{c}{2p_2} & 0 & 0 & 0 & 0 \end{vmatrix} \times \begin{vmatrix} U_{F1} \\ U_{F2} \\ U_{F3} \\ U_{F4} \\ U_{F5} \\ U_{F6} \end{vmatrix} \quad (4)$$

To make understanding easier, those values which differ from zero in the theoretical expression also are printed in italics.

The results showed, on the one hand, the extent to which we succeeded in making the identical measuring elements truly identical. In principle, the measuring bodies 1 and 2, and 5 and 6 are identical. The near identicalness of the absolute values, shown in italics, of the columns for 1 and 2, and 5 and 6 in the A^{-1} matrix confirms the identicalnesses within the manufacturing tolerance.

We can evaluate the magnitude of the undesirable crosstalk expressed as percent of the maximum absolute-value element in the individual rows of the $\bar{A}^{-1}$ matrix. According to this, the maximum crosstalk in the first row, for example (during the determination of the value of F_x), is

$$\frac{a_{16}}{a_{13}} \cdot 100 = \text{approx. } 3\%$$

In a similar manner, we obtain the values of 34%, 10%, 4%, 2%, and 6% for the other rows, in this order. It is evident that the extent of undesirable crosstalk is significant particularly in the measurement of the F_y, F_z, and M_z components.

How are we to assess this phenomenon? Since the elements theoretically of the value zero of the decoupling matrix differ from zero significantly in some areas, we must consider these elements too in the realization of the measuring circuit. Accordingly, the decoupling matrix theoretically containing 14 elements that differ from zero has in fact more than 14 such elements. The question rightfully arises whether it has indeed made sense to settle on the layout illustrated in Fig. 5, and whether it should have been advisable to first make an easier-to-manufacture measuring head of several matrixes? An answer to this question can be given only if we have additional experimental information available. At the present time, all we can say is that consideration of the relatively high crosstalk weighs still little, thus generating smaller faults than a measuring head with a theoretically higher-weight factor.

The configuration of the decoupling matrix established on the basis of the measured data (dimensions: [F] = N; [M] = Nm; $[U_F]$ = mV):

$$\overline{\overline{A}}^{-1} = \left\| \begin{array}{rrrrrr} 0{,}4956 & 0{,}5192 & -0{,}6861 & 0{,}0066 & -0{,}0054 & -0.0181 \\ 0{,}0346 & 0{,}0304 & -0{,}0545 & -0{,}1586 & -0{,}0110 & 0{,}0020 \\ 0{,}0191 & 0{,}0389 & -0{,}0265 & -0{,}0242 & -0{,}3650 & -0{,}3519 \\ 0{,}1106 & -0{,}0673 & -0{,}1154 & -3{,}0444 & -2{,}0706 & 1{,}6061 \\ -9{,}1462 & -9{,}7775 & 15{,}7319 & 0{,}0806 & 0{,}3026 & 0{,}3131 \\ -2{,}1322 & 2{,}0747 & 0{,}1231 & -0{,}0214 & 0{,}1286 & 0{,}05818 \end{array} \right\| \qquad (5)$$

Analog and Digital Signal Processing

The goal of the signal processing is the generation of electrical signals in proportion to the force and torque components to be measured, so that the signals are also suitable for processing in a computer operated in the on-line mode.

Figure 10 illustrates the block diagram and the most important signals of the force-measuring device developed in the course of our project.

The most important steps of analog signal processing are the amplification of the low-level $\overline{U}_F$ signals originating from the measuring bridges and the realization of the decoupling by electronic means. The low-noise, low-drift amplifiers, marked "C," include the organs for accomplishing the required zero-point shifting (taring). The adequately high signal level of the channel amplifiers makes the use of special analog integrated circuits in the decoupling computer unit unnecessary. The computer unit contains totalizer circuits with up to six inputs, of which the input weight factors can be set to the corresponding values of the decoupling matrix (Equation (5)) described earlier. In order to have the totalization right in terms of sign, we also need the derivation of the inverted values of the output voltages $\bar{U}$ of the amplifiers. The "-1" unit, containing six unity-gain inverters, performs this task.

The voltages $\bar{U}_1$, proportional to the force and torque components to be measured, are measured digitally with the measuring instrument set to MEAS, with the aid of the measuring-point selector (MUX) and the analog-to-digital converter.

In the LOCAL mode of operation, the measuring-point selector can be stepped manually via the MUX VEZERLO [MUX CONTROLLER] unit. In the REMOTE mode of operation, addressing via the computer through the BSI is possible. The analog-to-digital converter, Type AD 2010 E/R (Analog Devices), serially transmits the measured values to the computer in the two-byte BCD code via the BSI interface unit. The speed of the analog-to-digital converter is 24 conversions per second.

Zeroing of the measuring bridges is accomplished in the ZERO switch position, as is the taring in any position of the robot arm. The MUX VEZERLO simultaneously operates the two measuring-point selectors, and the position of the ZERO/MEAS switch determines whether measurement or zeroing (taring) is carried out.

The DISPLAY unit consists of the row of LED's indicating the selection of the components to be measured, and the 3-1/2 digit, seven-segment display built into the analog-to-digital converter.

The photograph of the measuring instrument is shown in Fig. 11.

Fig. 11. The electronic signal-processing unit of
the force and torque meter
[photograph not reproduced]

Experimental Results

Using the signal-processing device developed on the basis of the decoupling matrix (Equation (5)) established from measured data, we repeatedly examined the performance of the force meter on the test bench.

Of course, the realization of the elements of the matrix (5) can be at a finite accuracy only; furthermore, the electronic circuits have errors too, so that ultimately, it can be stated that, using the six-component force and torque meter,

- The linearity error of a single measurement of a force or torque component, relative to the theoretical straight line, is up to ±7% of the full deflection;

- the maximum crosstalk error (only in case of measurement of defined components: M_y when measuring F_x, M_x when measuring F_y, and M_y when measuring F_z): 10% relative to the nominal measurement range. The crosstalk is less than 5% for the other components;

- the shifting of the zero point is never more than ±2% even after repeated load cycles;

- there was no evidence of hysteresis.

Acknowledgment

The six-component digital-output force and torque meter realized as a result of the research/development project described in this article is due to the cooperative effort of a team. The authors thank Mrs Ferenc Juhasz, assistant staff scientist, for the preparation of the computer programs; Tibor Csubak, assistant staff scientist, and Laszlo Kuti, assistant professor, for making the digital signal-processing unit and the power-supply device.

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CSO; 2502

ROMANIA

BRIEFS

LASER RESEARCH, UTILIZATION--Romania, one of the first countries in the world to construct lasers with its own resources (the helium-neon laser in 1963), has given and continues to give special attention to this new field of technology with more and more numerous applications in the most varied fields of contemporary life: in medicine, in the transmitting of information, in geodesy, in aviation, in telemetry, in construction work, in optics, etc--applications which envisage the use of the laser for peaceful purposes. The policy of the Romanian Communist Party assigns an important place to basic and applied scientific research. The implementation of this policy took concrete form with the establishment of the Institute for Physics and the Technology of Radiation Apparatuses (IFTAR) which, together with the research in the field of lasers and its application carried out in other institutions such as the Bucharest Polytechnical Institute and the Military Academy, continues the Romanian tradition in this important field of science and technology. [Excerpts] [Bucharest VIATA MILITARA in Romanian Nov 80 p 23]

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12 August 1981

East Europe Report

SCIENTIFIC AFFAIRS

No. 710

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12 August 1981

EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 710

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CZECHOSLOVAKIA

STRUCTURAL PROBLEMS OF CZECHOSLOVAK ENGINEERING

Prague JEMNA MECHANIKA A OPTIKA in Czech No 5, May 81 pp 113-116

[Unsigned Article]

[Text] We stated in an article entitled "In the Atmosphere of the CPCZ Congress" (No 4/1981) that the main structural problem of Czechoslovak engineering is inadequately developed electronics, particularly its modern component base, which makes it totally impossible to handle higher generations of computer systems, to develop cybernetization and robotization. More than that, electronics is penetrating into an increasingly larger number of branches of mechanical engineering. The eighties and nineties will be years of application of microprocessors. Without microprocessors, it will be impossible to sell many products, including those which are exported today on a large scale to nonsocialist countries. It is obviously true that in 3 to 5 years a unit of an exported product will include about 20 percent electronics, 5 to 6 percent equipment for protection against airpollution, and 20 percent more accessories such as pumps, compressors, hydraulic equipment, pneumatic equipment, heavy-current electrotechnical gear and bearings.

It is assumed that in addition to their use in computers, microprocessors will also be used during our Seventh Five-Year Plan in telecommunications equipment, measuring and control instruments, electric household applicances, photographic instruments, scientific instruments, electrical installations, forming and turning machinery, plasticization machinery, textile machines, and packing machines. Additional fields will be included in the following five-year period. The only area where they are not expected to be applied is the manufacture of railroad freight cars. All this indicates the urgency and seriousness of the structural problem of what is called the electronics industry. What is our situation? We mentioned this problem once before in our periodical. Now we are concerned with summarizing it and especially with determining its future!

The rapid advance and development of the use of electronics are brought about especially by the following facts:

a) electronics can be a substitute for man's mental capacities and can multiply their individual functions;

b) this substitution of man's mental capacities takes place at low energy levels and in increasingly smaller parts of matter, which results in unusually low demands for energy, material, and time in application and operation;

c) due to the characteristics specified in sub a) and b), the introduction of electronics in the manufacture of machinery, instruments and equipment results in a qualitative increase of their original parameters, which in turn makes it possible to create new information systems and cognitive and decisionmaking processes in all areas of human activity;

d) the scientific-technical development of electronics is one of the most dynamic processes. It shows an increase of technical parameters of a whole order in the course of several years, because it expands and multiplies several times the assortment of products to satisfy needs during a decade;

e) microelectronic technologies of the primary base lead to constant decreases of dimension and weight, which are accompanied by decreases of production costs and prices of functional units at rates which are unprecedented in the history of mankind (price decreases by three orders in 20 years), with analogical impacts on decreases of the dimensions, weight, production costs, and prices of the final products of the electronics industry;

f) as a result of the effects described sub a) to c), the production technologies of entire industrial branches can be changed, with significant results obtained in improvements of the quality of products, production economy, rationalization of energy consumption, and reduced demands for manpower, and also in the technology and activities in the nonproduction sphere. Finally, in the area of personal consumption, the development is becoming a significant factor in the operation of households and arrangements for the use of time off from work.

In view of the present situation and the growing trends in the application of electronics in other production of the machine industry, it is necessary to evaluate the share of electronics as a whole in the production of ministries of mechanical engineering (communication engineering, electronics and parts, computers, automation, and so on). We must state at this point that in Czechoslovakia this ratio is 8 to 10 percent, while in industrially advanced countries it varies from 13.5 percent (Sweden) to as much as 25 percent (Belgium). Annual production increases in these states were also substantially higher in the past years than in Czechoslovakia. And we do not give examples of countries such as Japan and the United States, which are in the forefront of the development of electronics in the world. One should add that a certain change is expected in this unfavorable development in the Seventh Five-Year Plan. At the same time, what is most important by far is not so much the development of final production, such as the production of computers, television sets, transmitters and so on, but first of all the development of the production of parts, particularly microprocessors.

However, the problem of structure, under the conditions which exist in Czechoslovakia, is not covered merely by pointing out the main structural disproportion, which is electronics. One must examine other questions as well. We believe that in the case of a state which has such a high share of exports (and must have a higher share yet), the proper export structure is that which corresponds to the demand for machinery on the world market and also takes in consideration the future structure of mechanical engineering in advanced industrial states, i.e, the fields of mechanical engineering in which those states are investing today.

During the last period of 10 years and for the next 10 years, demands for imports in the world (an increase of imports of machinery of more than 6-8 percent annually) are concentrating in the following fields of mechanical engineering (in a decreasing order):

--machines for the production of electric power from nontraditional sources;

--installations for oil extraction from the seas;

--parts base of the fourth generation (microprocessors);

--equipment for protection against air pollution;

--computers;

--equipment for long-distance data transmission;

--nuclear reactors;

--gas turbines;

--aviation motors;

--electric medical instrument;

--electric measuring control and regulatory equipment;

--pneumatic and hydraulic elements;

--electromechanical tools;

--chemical installations;

--rubber industry installations;

--construction machinery;

--lifting and transportation equipment (internal transportation in factories);

--telecommunication equipment;

--airconditioning equipment;

--electric furnaces;

--foundry equipment;

--compressors and pumps;

--packing machines;

--color television equipment;

--food processing machines;

--trucks;

--installation of steam and hydroelectric power plants;

--electric automobile equipment;

--roller bearings;

--electric household appliances;

If we examine the list of these fields, we find that the Czechoslovak machanical engineering industry has in its production program all the production fields for which demand in the world is above average, with the exception of the equipment for the production of energy from nontraditional sources, which does not necessarily mean only, for example, the use of solar energy, and with the exception of equipment for oil extraction, electronic products of the fourth generation and effective equipment for prevention of air pollution. At the same time, it is characteristic that the given four production fields which we cannot handle, at least not at a supermodern level, (fourth generation = microprocessors, highly efficient air filters and separators), are precisely the fields in which the annual increase of imports amounts to more than 15 percent.

And so one can assume that if these fields show the highest demand for imports, then their development rate should also be above average.

1980/1975 Production Development Rate

Computers	174
Nuclear reactors	18x
Gas turbines	177
Electric medical instruments	164
Measuring and regulatory instruments	175
Pneumatic elements	131
Hydraulic elements	223
Electromechanical tools	105
Chemical installations	135
Rubber-processing machinery	192
Construction machinery	195
Transportation equipment	172
Installations for manufacture of building material	156
Telecommunications equipment	206

Airconditioning equipment	149
Electric furnaces	148
Foundry installations	123
Volumetric compressors	114
Turbocompressors	184
Pumps	156
Packing machinery	163
Color television	---
Food-processing equipment	170
Trucks	156
Steam turbines	102
Water turbines	165
Passenger cars	156
Car accessories	140
Roller bearings	156
Electric Household Appliances	141

The table shows clearly that the predominant majority of the production fields listed above were developing during the Sixth Five-Year Plan at a rate which was above average. As a result of it, their share in the production of the entire mechanical engineering industry increased from 22.3 percent in 1975 to 30.4 percent in 1980.

In spite of that, one cannot say that we would experience a surplus of these products in the national economy, or that these products would take care of exports. On the contrary! The national economy could "feed" more computers than it gets, and at the same time domestic consumption competes only with exports to the socialist countries. The situation is similar with regard to nuclear reactors. The deficit in taking care of the requirements in terms of measuring, regulatory, and automation equipment during the Sixth Five-Year Plan amounted to several billion korunas. In spite of the high rate of growth of the production of hydraulic elements, these accessories are not available for construction machinery, agricultural machinery, cars, mining technological equipment, excavators, lifts, presses, forming machines and so on. With regard to installations for the chemical and rubber industries, demands from the USSR and domestic requirements for investment construction are not covered. Also, we could export more to nonsocialist countries. The production which is traditionally in short supply is the production of tools of all kinds and highly productive and mechanized casting installations are not available for purposes of modernization of foundries. Pumps and irrigation equipment can be exported advantageously to economically underdeveloped countries and irrigation in our agriculture could be expanded. Transportation equipment is lacking for open-pit and deep-mining operations. With regard to food industry equipment, the USSR is calling for larger deliveries. Trucks are exported on a larger scale to both areas of the world, car accessories have been a bottleneck for a long time, and so on.

This means that there is a clash between the foreign trade requirements and domestic investment construction in specific production facilities. The only solution is to keep increasing production faster than before. Naturally, when we talk about increasing the manufacture of final products, we must in the same breath also consider proportional development of the production of accessories. Although the rate of speed of the production of accessories kept surpassing by far the production rate of the mechanical engineering industry (the production of general engineering and heavy engineering industries increased 37 percent, accessories 55 to 60 percent), the production of accessories was the main drawback which hampered continuous manufacture and completion of final products. There were not enough cables, distributors, fittings, pneumatic equipment, transmission gears, crankshafts, car accessories, products made of plastics, piston rings, couplings, electromotors, batteries. The annual deficit of accessories amounted to as much as 4.5-5 billion korunas at the end of the Sixth Five-Year Plan. At the same time, the production structure of the Czechoslovak mechanical engineering industry shows a certain paradox in the fact that even those production fields which are developing in the world at a rate which is below average, are also lagging behind in Czechoslovakia. This applies, for example, to rolling installations, metallurgical and coking installations, railroad, rolling stock, installations for the light industry, and so on.

And so, if we wanted to give a general characteristic of the main structural problems of the Czechoslovak mechanical engineering industry; we could make the following statement:

--the main disproportion of the structure in the quantitative sense consists today in the low share of electronics in the overall volume of machine building, and in the quantitative sense it consists in the fact that the production of modern, progressive components is lagging behind;

--in other areas, the Czechoslovak mechanical engineering industry in essence correctly reflects the trends in terms of the structure and mutual relationship of the fields which are developing adequately and those which are developing at a below-average rate. However, the head-start rate of progress of the so-called progressive fields does not take care of the needs of the national economy;

--the development rate of the so-called accessories fields during the past period did not eliminate the disproportion which exists between the production fields of final products and accessories;

--the decrease of demand for products of some production fields which is manifesting itself in the world, does not appear as yet in Czechoslovakia and in other socialist countries because of investment demands within these countries.

As a result of all this, the products of perhaps every field of the Czechoslovak mechanical engineering industry are in short supply, and efforts to carry out the so-called dampening-prevention drives have very limited results.

Such an analysis is important both for the Seventh Five-Year Plan and, especially, for the long-range outlook. However, it is also necessary at the same time to note other very interesting and telling symptoms.

The given fields are unquestionably those which had and continue to have the highest import trends in the capitalist countries (and consequently the highest export trends in Czechoslovakia). These trends are undoubtedly strengthened, with certain exceptions, in imports of the socialist countries. They are an index of the conjunctural trends in the production and exports of states with mechanical engineering industry operating for export. However, there are countries which show the most progressive technical trends and thereby also those of the export currents of tomorrow. These countries are selecting only some production fields from the set given above, and they are giving special attention and support to them. On the other hand, they are discontinuing certain types of products which they export today, because they know that they will soon be competing with those states which have already acquired the know-how in the manufacture of such products and will appear on the market. And so, we are holding a sort of first place in the set given above, where the technical level is so high that only a few products in the world can reach it. And then we have fields of some sort of second order, which still represent and will continue to represent in the next 5 to 7 years the top level in the world in terms of demands for technical research and development. However, many manufacturers of machinery have already acquired the know-how in these areas today.

From this point of view, it is interesting to learn about what Japan is doing since it is a country which provides an index of technical progress and expansion of exports in the world. It seems that they have gambled everything on electronics and, as part of it, on the development of microprocessors. They have at their disposal a microprocessor which can store 16,383 bits of information per square centimeter of silicon. They now have the know-how to store 64,000 bits per square centimeter, and they also have a superchip with 250,000 bits per square centimeter. In addition, they have developed the use of an electronic ray, which can store 1 million bits per square centimeter. They have the know-how for the manufacture of the latest reactor motors for the American F15 fighter plane. A consortium of three Japanese firms has signed an agreement about the development of a new generation of Rolls Royce aviation motors.

With the help of large state subsidies, they are now orienting investment construction and future production in terms of production intensification in relation to automation, they are investing in the area of integrated circuits, industrial robots, small industrial computers, digitally contolled machine tools, reactor technology, equipment for protection of theliving environment. Which means everything for automation, everything for labor productivity. The progress made in the use of microprocessors has made it possible now for robots to operate at the hourly "wage-costs" of $4.60, while an American worker employed on a car assembly line earns $16 per hour. Discussions are held to the effect that 50 to 75 percent of the jobs of manual workers can be replaced with industrial robots by the end of the century. The Japanese are very drastically reducing investments in production fields where they are flooding the world with their products, in the automobile and shipbuilding industries. That says a lot. They are holding down production in those areas which are beginning now to be captured by industrial states not in the forefront of industrial progress.

The law on subsidies of the mechanical engineering industry and production of data-processing equipment which has passed in 1978 is to help in providing technological support for the key industries in Japan. This law, the most important tool among many supporting legal provisions, is to be in effect until 30 June 1985.

The mechanical-engineering and electronic industries, including the production of data-processing equipment, represent the core of legally established support of key branches of economy which are highly demanding in terms of technology. These industries are expected to provide not only for a considerable productivity increase, but also for innovation impulses which in many ways affect all spheres of the processing industries.

The main interest of the Japanese economic policy under specific conditions (exceptionally high dependence on imports of raw materials, especially crude oil) is further specialization in high-quality products which are technologically demanding. That assumes an even more significant intensification of technological research and development.

The main goals of the law are rationalization and automation on the basis of systematic technological research and development. Additional goals are as follows:

--improvements of production quality;

--introduction of new production technologies, particularly those which lead to savings of material and energy;

--standardization and normmaking, by which parts of machinery are to be made more interchangeable, and as a result the machines could be used for multiple purposes;

--respect of the requirement concerning protection of the living environment;

--greater use of sources of raw materials, which were not used at all so far, or were used inadequately;

--recycling of industrial and household waste material.

These goals are supposed, on the one hand, to make it possible to expand further the technological head start against foreign competition in those industries where the Japanese industry holds a leading position (electronics) and, on the other hand, to catch up in those branches where technology is lagging behind (software in computer technology, communications engineering, information processing), and where Japanese industry has not reached the international level as yet. At the same time, special significance is attributed to reduction of the dependence of Japanese industry on foreign licenses and know-how.

A characteristic feature of the law is that it deliberately gives up subsidies of all branches of given production fields. The law rather stresses preferential treatment of branches and unit groups in the mechanical-engineering industry, where subsidies are considered to be desirable, for example, in the electronics industry and communications engineering.

The elasticity of the law is to be increased by provisions for the possibility of adjustments under certain conditions (for example, in cases of unexpected breakdowns in the development of the economy as a whole).

A total of 89 groups of products or production fields are designated as sectors which are to be subsidized. The key points in the industry of electronic instruments are: instruments for radiation measurements, and also medical, navigation and ultrasound instruments, laser technology, electronic tubes, structural elements, piezoelectric ceramic parts, peripheral instruments for digital computers, elements with liquid crystals, and increased sensitivity of magnetic tapes for tape recorders.

In the mechanical-engineering industry, attention is to be paid particularly to the following tasks: digital machine tools, metal-forming machinery, increase of production speed of machine tools, decrease of energy consumption of conveyor belts, decrease of energy consumption of refrigerating equipment, increase of output of textile machinery decrease of noise of industrial sewing machines and construction machinery, stricter hygienic regulations concerning food-processing machines, more rigid requirements concerning environmental protection in the case of paper-mill machines, increase of precision of instruments for technical measurements, increase of safety of packing machines, decrease of noise of wood-processing machines or foundry machinery, reduction of noise of tractors, greater accuracy of control of certain values, decrease of noise of forgoing presses, achievement of top technological level of the software of fourth generation computers, and higher quality of sintered metals.

The key points given above indicate priorities in the technological policy of Japan up to the middle of the eighties. At the same time, one can also deduce from the goals of the structural policy assigned to industry the conclusions concerning the key points of Japanese exports in the forthcoming years.

The example of Japan can tell us a great deal in our considerations about the most suitable structure of the Czechoslovak mechanical engineering in the future. This structure will be discussed in forthcoming articles.

5668
CSO: 2402/70

BRIEFS

NEW COAGULANT DEVELOPED--Developed by the State Research Institute of Textiles in Veverska Bityska, Traumacel is a preparation in the form of a yellow powder which stops capillary bleeding within 2 minutes. It can be woven into bandages which are less bulky than traditional ones. Its Pruban version is a hollow bandage which can be quickly donned on any wounded part of body; Svutin is an adhesive type of bandage. Traumacel can also be used in surgery of brain, heart, liver, kidney and other organs, as well as plastic and other types of surgery. [Prague PRACE in Czech 29 Jul 81 p 6]

PRODUCTION OF GIANT CRANKSHAFTS SCHEDULED--Production of new types of crankshafts for marine engines has begun at the Klement Gottwald Iron and Engineering Works in Ostrava. Its plant No. 3 is being retooled for production of giant superheavy crankshafts which weigh up to 152 tons and measure between 10.6 to 12.75 meters long. [Prague PRACE in Czech 31 Jul 81 p 3]

CSO: 2402/77

PLANS, PROBLEMS OF RADIO ENGINEERING ENTERPRISE NOTED

Budapest NEPSZABADSAG in Hungarian 29 Jul 81 p 3

[Excerpts] The basic job of the REMIX Radio Engineering Enterprise is to provide domestic consumers with modern, passive RC elements and hybrid circuits. The factory makes electronic parts such as resistors, condensors, potentiometers, thick and thin-film integrated circuits with insulated substrate. The three factory units employ 3,700 persons of whom 472 are party members. The units are located in Szombathely, Tiszakecske and Budapest.

During the past five-year plan, the enterprise was able to implement only approximately half of its development and reconstruction plans. It lacked the credit to switch to production of more up-to-date products. It was unable to find the wherewithall to develop the production technology, to buy and put into operation highly productive, automated production lines needed to attain its goals.

Problems were aggravated by the fact that only a part of its 274-million-forint machine park met current requirements. As of the first of January, 1981, the value of that part of the machine park that had to be completely written off amounted to 113 million forints. This will require replacement.

Electronic equipment is playing a definitive role not only in the electronics industry but in all spheres of production. To meet the growing demand, the industry must invest 500 million forints during the Sixth Five-Year Plan and achieve a production increase of at least 75 percent. As an example, fabrication of integrated circuits must grow from small to large-scale production and amount to 3 million units per year.

To increase efficiency, five main departments and six departments have been merged and the number of managing personnel has been decreased by 33 persons. This has simplified and streamlined management and decision making.

Despite technical development which will cost half a billion forints, no major wage increases are in sight. Wages at the enterprise are modest, amounting to an average of 36, 132 forints annually. Although every effort will be made to retain worker loyalty through higher wages for better work, the enterprise plans to increase certain fringe benefits to the tune of 100 million forints during the Sixth Five-Year Plan even if this means paring away funds from other investments.

CSO: 2502/90

APPLICATION OF MAGNETIC DATA CARRIERS DESCRIBED

Warsaw BANK I KREDYT in Polish No 4, Apr 81 pp 106-108

[Article by Zofia Porembska: "Preparation of Data Carriers--A Condition for Proper Data Processing"]

[Text] In the 1960s work began on automating banking operations which led to a significant expansion of information science in the bank. The systems, above all encompassing accounting work, that at present are functioning in the bank are the System for Banking Operation [SOB], the National System for Electronic Clearing of Savings [KSERO], the Savings-Checking Accounts System [ROR], and the Systematic Savings Accounts Calculations System [ROSO]. According to 1980 data:

--the SOB was in operation in 171 operating and integrated branches, that is, 36 percent of all such branches. This system processed 55.7 percent of all operations. In addition, the SOB was applied in 35 special branches (about 15.7 percent of all such branches);

--the KSERO was in operation in 290 special and integrated branches, which represents 95.1 percent of all such branches. This system processed 98.6 percent of the total number of current savings accounts and about 98.6 percent of all operations for this form of savings.

In addition to the indisputably significant improvements achieved in branch operations with the application and operation of the above-named systems, a number of problems, frequently difficult ones to surmount, especially concerning equipment used by the bank, also appeared. One of them will be mentioned here, namely the problem relating to equipment to verify data carriers. In 1980, 348 out of 423 automated bank branches, or 82.3 percent of the total, verified data carriers on Addo-X punch-adders, that is, on equipment to verify paper data carriers. (At the end of 1980, the bank had 976 Addo-X punch-adders in operation.)

The remaining branches, 75 or 17.7 percent of the total, verified data carriers are on Seecheck, Mera-9150, System M-10 and Mera-100 magnetic systems. The use of magnetic data recorders--thanks to the possibility of checking data corrections of data while verifying data carriers--permits errors to be eliminated from operating files and, at the same time, decreases processing time at a computer center.

The increasingly higher computing power of computers which the bank uses (for example, ZETO [Electronic Computer Computation Centers] computers, and computers in our own centers) require increased productivity from workers employed in the data-preparation process, as well as improvements in and verification of the quality of their work. The most extensive use possible of multiposition equipment systems to record and initially prepare data on magnetic carriers, which over the next several years should completely replace the now traditional methods of preparing data on paper carriers, will undoubtedly fulfill these conditions. Punch-adders are technically obsolete devices for verifying data carriers; their productivity is relatively low, and the scale of errors produced is high. The age of the machines used by the bank branches and the poor quality of the paper produced in Poland to produce perforated tapes also contributes to the problem. The initial purchase of Addo-X punch-adders for the bank was made in 1966, the latest purchase was in 1976. The possibility of continuing bank operations during the period magnetic data-carrier preparation equipment replace paper data-carrier preparation equipment has become very limited over the past several years. Undoubtedly the trend of development of Poland's electronics industry, which in a 20-year period has not completely eliminated or minimized the dependence of its production on foreign licenses (and thus on foreign-exchange funds necessary for their purchase), has affected the progress of automating bank operations, especially in the number and quality of equipment installed in the bank. It should be noted that the production of hardware, especially less complicated equipment, for example, machines to verify data carriers, need not be imported from the capitalist countries and can be produced in Poland or in close collaboration with the socialist countries. Such a trend in developing the hardware base in Poland would permit the automation of bank operations to be accelerated and also eliminate the difficulties now confronting us in this sector.

Till now, all foreign-produced hardware and most domestically produced hardware have been foreign-exchange purchases, including 41 Mera-9150 systems with work stands (including Seechecks), 55 M-10 System stands, and 55 Mera-100 devices. The main principle of installation directs that multikeyboard equipment be installed in the larger urban centers and Addo-M-10, Mera-400 and Mera-100 data carrier verification equipment be installed in small and medium branches. Table 1 lists the locations of the discussed equipment.

The extensive replacement of Addo-X punch-adders with equipment to record data on magnetic data carriers is not now possible because of financial reasons. If financing and foreign-exchange conditions are favorable, in 1981 the bank intends to purchase:

--7 Mera-1950 systems for the Bialystock, Katowice, Warsaw and Zielona Gora regions;

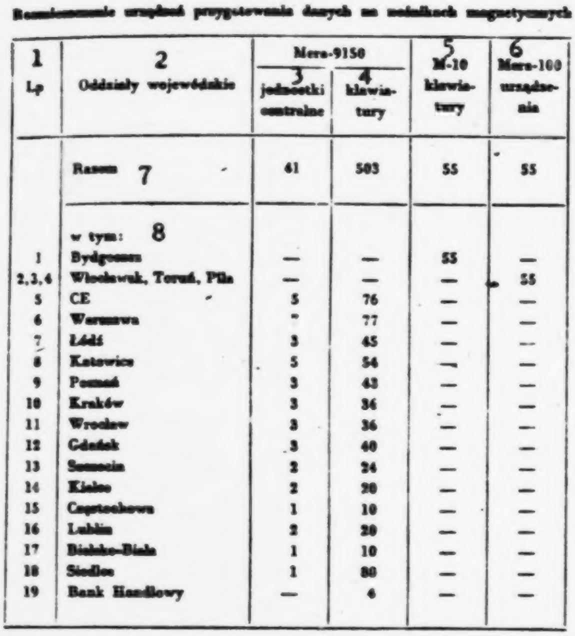
--200 Mera-100 devices to supplement existing equipment in the Bydgoszcz, Wroclaw, Torun, Pilsk and, eventually, the Opolski voivodship regions;

--on an experimental basis, one Mera-400, with the idea of using these devices more extensively in the future in bank branches.

The planned purchase in 1981 of magnetic equipment to verify data carriers will not resolve to any great extent the difficult problem of replacing paper data-carrier preparation equipment with magnetic data-carrier preparation equipment;

it also does not appear realistic for the future. Considering Poland's complicated economic situation, the bank cannot count on a foreign-exchange allotment to permit it to realize its initial goal, which is to replace by 1985 the Addo-X punch-adders with magnetic data-carrier preparation equipment. The exchange on average of about 200 Addo-X punch-adders annually for magnetic equipment to verify data carriers has been planned. This means that most branches, especially the smaller ones, will probably continue using the punch-adders up to 1990.

Table 1. Location of magnetic data carrier preparation equipment



Rozmieszczenie urządzeń przygotowania danych na nośnikach magnetycznych

1 Lp	2 Oddziały wojewódzkie	Mera-9150		5 M-10 klawiatury	6 Mera-100 urządzenia
		3 jednostki centralne	4 klawiatury		
	Razem 7	41	503	55	55
	w tym: 8				
1	Bydgoszcz	—	—	55	—
2, 3, 4	Włocławek, Toruń, Piła	—	—	—	55
5	CE	5	76	—	—
6	Warszawa	[illegible]	77	—	—
7	Łódź	3	45	—	—
8	Katowice	5	54	—	—
9	Poznań	3	43	—	—
10	Kraków	3	36	—	—
11	Wrocław	3	36	—	—
12	Gdańsk	3	40	—	—
13	Szczecin	2	24	—	—
14	Kielce	2	20	—	—
15	Częstochowa	1	10	—	—
16	Lublin	2	20	—	—
17	Bielsko-Biała	1	10	—	—
18	Siedlce	1	80	—	—
19	Bank Handlowy	—	6	—	—

Key:

1. Item
2. Voivodship branches
3. Central processing units
4. Keyboards
5. M-10 keyboards
6. Mera-100 devices
7. Total
8. Including

A certain amount of improvement in this sector in the future can result from the use by the bank of the TELZIS [Telegraph System for the Collection of Report Data], developed by the Administration for the Mechanization and Automation of Statistical Reports, patterned after the one already operating at the GUS [Main Office for Statistics]. The initial attempts to use a similar system already have been started by the bank; this system is based on transmitting data via teleprinters directly to the Mera-9150 equipment. More extensive use in banking of this system, which uses teleprinters to transmit data, is expected in 2-4 years which undoubtedly will release some Addo-X punch-adders for use by those bank branches which need them most.

In view of the continuous growth in bank operations, the distribution to the branches of fewer pieces of data-carrier preparation equipment than was assumed, will require special attention to the full use of equipment now on hand, magnetic as well as paper, and the proper maintenance of this equipment. This problem requires that automated branches and voivodship regions immediately conduct an indepth analysis of equipment usage and the optimal use of all data-carrier equipment that are operated in a given area, especially magnetic data-carrier equipment, in order to fully utilize certain reserves that still exist there. The ideal would be to develop for every automated branch and voivodship region a system of operation in this sector which would permit this difficult task to be accomplished.

Multiyear operation of the Addo-X punch-adders increases the frequency of machine failures and causes longer shutdowns of utilized machines, but at the same time the failure rates for this equipment can be decreased significantly by proper and more frequent maintenance and continuous technical inspections. Increasing the frequency of equipment inspections and proper equipment maintenance will assuredly increase equipment life. And what does the technical service of these machines at the NBP [Polish National Bank] look like today? In Poland, the following are in operation:

--17 RWNs [Regional Repair Shops];
--27 PNs [Repair Points].

It appears that the number of repair points is too small because technical service for operational Addo-X punch-adders is wanting in 16 bank regions in the 49 voivodships that are now automated. This means that when machines fail in these regions, technical service must be obtained from other regions. It takes much longer to get a diabled punch-adder repaired because it takes a longer time for a mechanic from another region to come and make a repair. From practice we know that at times a branch must wait for a month or longer for a mechanic to arrive. These unusable machines cause long delays in bank branch operations and many other related problems. We also know that today each punch-adder is subject on average to maintenance only once per month and even once every 2 months, which, considering the present technical state of the machines, is not often enough. To avoid frequent machine failures and their associated shutdowns, a daily technical inspection of the punch-adders used by the branches is a necessity. Thus, selecting the proper path to assure optimal use of all data-carrier preparation equipment, especially magnetic equipment, and to maintain as long as possible the full technical efficiency of equipment to verify paper data carriers in each branch and region are exceptionally important. It appears that the basic conditions for obtaining the discussed results can be defined precisely:

--first, by developing a goal-orientated model of operations for the near future concerning new applications and maintenance of currently operating systems. The model should be adapted to existing conditions in each voivodship regarding equipment on hand and the time reserves of operating equipment, especially magnetic equipment, to verify data carriers. Here one should also consider operating the Mera-9150 system on two shifts. Operating an expensive machine for two shifts would be advisable and would allow the elimination in the future of the Addo-X punch adders.

--second, the development of an organizational-technical concept in a time frame which would facilitate proper technical servicing of equipment, directed above all toward expanding the technical maintenance service network for Addo-X punch-adders. The creation in each automated region of a two-person technical maintenance service team would be a correct action. An even better solution would be to have such service available at each automated branch that verifies data carriers on Addo-X punch-adders.

It would also be worthwhile to think about means of providing in the voivodships technical service for equipment to verify magnetic data carriers.

Third, a guarantee by the bank to provide spare parts in sufficient numbers for the RWNs and PNs for equipment used by the branches. This is an extremely serious problem because the lack of essential spare parts can cause shutdowns of data-carrier preparation equipment and even their withdrawal from use.

In signaling the above problem, I believe that with the active collaboration of the regional units with the Department of Information Science, we will be able to overcome the difficulties looming in the area of data-carrier preparation equipment in the present difficult foreign-exchange situation such that the bank could execute in full, as adapted to these possibilities, the plan of applications for 1981 as well as disallow any slowdowns in the present and future automation of bank branches.

11899
CSO: 2602/16

DATA ON FIRST INDUSTRIAL ROBOT, 'REMT-1'

Bucharest CONTEMPORANUL in Romanian 8 May 81 p 6

[Article by Gheorghe Sasarman]

[Text] In this month of May 1981, at the Electromotor enterprise of Timisoara, the first technical tests in our country are beginning on a manufacturing station serviced by a robot. Of Romanian design, built entirely with domestic parts, REMT-1 (Electromotor Robot No 1) has five degrees of freedom (horizontal, vertical, turning, as well as arm extension and twisting), is intelligent (can be programmed to perform complex operations, can be reprogrammed, knows the position of its hand--which can carry parts of up to 50 kg, conducts its activities under constant dialog with the machine-tools with which it collaborates, and can be taught to correct its movements), and is extremely skillful (replaces six workers per shift, in principle can work three shifts without interruption, and by eliminating waiting times, increases labor productivity by 80 percent). What does REMT-1 do? It picks up an unfinished shaft from a rough part storage and places it in an automatic lathe which machines steps of different diameters; at the end of this operation, the robot passes the shaft to a milling machine which cuts a first key slot, then to another milling machine to cut a second key slot; from here, the shaft is picked up and placed in a storage of finished parts. The manufacturing station also includes a second automatic lathe, which eliminates dead time (the lathe operation lasts as long as both milling operations together); this station is flexible, insofar as it can be programmed to fabricate all types of shafts for electric machines being manufactured at Electromotor.

"The robot-equipped work station," we are told by Marin Tanase, director of the enterprise, "was until now manned by 17 workers; these will be replaced by the robot and three operators. The effect? In addition to higher labor productivity, a reduced physical effort (the workers from this station will be assigned to other activities that are less demanding in this respect). We intend to extend this experience to two other work stations, already identified, and in parallel, to specialize a department for the mass production of robots of this type. The performance that you are witnessing did not come out of nowhere, but is the result of our collaboration with the Polytechnical Institute Traian Vuia, a collaboration which began more than 10 years ago and which seeks (through a program that currently includes more than 50 projects) to optimize the construction of motors produced here, as well as to improve technologic processes. This also explains the natural way in which our robot came to be, in response to production's concrete needs, and not--as in other cases--as a laboratory creation which is looking for a possible application."

Further details about the creation of REMT-1 and about other similar, long range projects, came from a discussion with Prof Kovacs Francisc, dean of the Mechanical Department, and Prof Tiberiu Muresan, dean of the Electrical Department, at the Polytechnical Institute, and coordinators of the comprehensive collective of teachers, students, and production specialists which has successfully completed this first Romanian achievement. We learned for instance, that a decisive role in the implementation of the robotics work being carried out at the Polytechnical Institute, was played by the guidance and indications which the secretary general of the party, Nicolae Ceausescu, formulated in September 1979, during his visit for the opening of the school year. The response has been prompt and full of enthusiasm: a first industrial robot was placed under technologic tests less than one year and eight months after the visit, in honor of the 60th Anniversary of the founding of the RCP.

"A great advantage of automation (and robotics represents the most evolved form of this process) as illustrated here," pointed out Prof Francisc, "is in the implicit obligation to perfect all aspects of the technologic process: not only must the robot adapt to the demands of the process, but the technology must adapt itself to the demands of robotics, i.e., precision, timing, painstaking adjustment of machinery and tools, perfect organization, and so on. The entire technologic process must be reviewed in the light of robot utilization, and even the workers in enterprises must improve their activities; since by definition the robot makes no mistakes, the possible errors of its human collaborators become even more apparent. Our colleagues at Electromotor have undestood this situation very well; we are also planning similar robot installations together with the enterprise Ambalajul Metalic (which among other things manufactures shuttles for looms) and the Timisoara Textile Enterprise (for operations in ring lifting during vicuna weaving, with application in many other mills in the country).

We also learned that as part of the national program for building industrial robots, the Traian Voia Polytechnical Institute coordinated two efforts (building the prehensile devices, the robot's hands, and some of the tactile, proximity, and force-moment sensors) and participated in three other ones (designing the orientation mechanism of the RIC-25 robot, collaborating on control problems, and working in conjunction with others on robot-welding technologies). And finally, the institute's laboratories are making intensive preparations to begin the construction of improved third generation robots (REMT-1, its builders sustain, belongs to the second generation), with more advanced sensors (including visual ones), and with control systems capable of making autonomous decisions (the programs are capable of branching in case of unforeseen situations). The interests of our specialists are thus approaching the peak performances achieved throughout the world in the matter of robotics; for this purpose, the department led by Prof Muresan has built an experimental robot (named PETRICA (Timisoara Experimental Project for an Advanced

Research Intelligent Robot), which was used among other things to model the REMT-1 program. We ended our visit with the feeling of having glimpsed one of the most promising and spectacular illustrations of the integration of education, research, and production.

Once on the firm ground of industrial plants, de-anthropomorphized, freed of their science-fiction aura, robots have assumed their terrestrial vocation of powerful, skillful, and docile helpers for man. Our specialists today contribute fully to this demythization, side by side with technical designers of robots throughout the world.

11,023
CSO: 2702/22

OPERATION OF AUTOMATED CASTING LINE DESCRIBED

Bucharest CONTEMPORANUL in Romanian 8 May 81 p 6

[Article by Prof Constantin Bala, pro-rector of the Bucharest Polytechnical Institute]

[Text] Some days change your life a for long time. Others pass by without notice and their significance becomes apparent only much later. And others yet, reverberate every second with the power of a steam whistle. I consider 23 February 1980 among the latter. Not only for myself, but also for the Bucharest Polytechnical Institute and for a whole branch of the national industry. On this day, the secretary general of the party, Nicolae Ceausescu--visiting the leading metallurgical enterprise of Romania's industry, the 23 August Enterprise--addressed to all the specialists a passionate and rousing call to modernize casting technologies. The Bucharest Polytechnical Institute was assigned the task of building an automated line. Not an easy task, and its urgency led to a concentration of forces unparalleled here. This vast operation mobilized specialists from 12 departments in seven of the institute's schools. Now that the action has reached its end, and that the automated casting line at the 23 August Enterprise has entered its technical testing stage, we can say that the achievement of this goal has been an unprecedented example of education-research-production cooperation. Working together with the staff of the Bucharest Polytechnical Institute have been specialists from many plants (the largest among these being the 23 August Enterprise, the Bucharest Enterprise for Tooling and Spare Parts, the Bucharest Enterprise for Electrical Machinery, Electrotehnica, Automatica, the Bucharest Enterprise for Assembly, Installations, and Automation, and Infratirea of Oradea), research and design institutes (ICSIT--Institute for Scientific Research and Technologic Engineering--Titan, ICSIT PSCI, ICSIT Faur, and so on), and students. In the complex coordinating activity, an important role was played by the Secretariat of the Party Committee of Bucharest, and by the Bureau of the Party Committee of the University Center. The automated line is the first of its kind in the country, and a large part of the system was built for the first time here. I should add that no piece of equipment from current production could be used without modification, and that nearly the entire project was completed in addition to the plan's tasks.

And now for a few technical details. The automated line--designed, partially built, and supervised by the institute until it was placed in operation at the 23 August Enterprise--is used for casting the collector cover of the MTU engine, a part that is demanding and complicated because of its large dimensions and thin walls, and cooling channels and special geometry (the fabrication of this part by means of other processes requires a great deal of time and manpower, and in most cases the quality is not satisfactory). The casting is performed in metal forms (molds), using the following operations: automated cleaning and painting of the mold; automated positioning of the core; automated feeding of liquid metal; automated extraction of the cast part; mechanized cutting of webs and veins; evacuation of the core; semi-automatic welding of covers necessary to set and evacuate the core; automatic control and testing of the finished part.

I want to emphasize that this involved not only a great effort of energy concentration, but also a large investment of true creativity. The work elicited emotions similar to those of artistic creation, elation and wavering, moments of inspiration, and unexpected problems.

After defining our goal--the automated casting line--and the steps for reaching it, we raised the question of a thorough updating. We rapidly reviewed the advanced research being carried out throughout the world and circled the area of interest: casting in evacuated molds, a method applied in only a few countries. Some of the major advantages of this method over conventional ones are first of all, that the cast parts require less additional processing--with obvious favorable effects on metal consumption and manpower costs; and secondly, that the process also requires much less power. To this we could add a simplification of the technologic process (by reducing the number of steps) and increased production per square meter of floor space. Because the need for a binder in mold formation is eliminated (a role played by the vacuum), the method radically improves working conditions, especially in areas which at present are highly noxious.

We worked with great dedication to adopt this method: often 18 hours a day, for weeks, without rest. Results were soon forthcoming: in August 1980, experiments were started at the pilot line of the School of Metallurgy; and in October 1980, the first parts were cast by this method (in aluminum, at a temperature of 650-730 degrees C; currently, we are casting both steel and iron parts at high temperatures, as well as parts made from non-ferrous alloys or synthetic resins). About 15 patents were filed, and others are being finalized. And during this year, the first industrial installations for casting in evacuated molds were placed in operation at Vulcan, 23 August, and the Grivita Rosie chemical equipment enterprise.

Similar installations are being built at Grivita Rosie, Semanatoarea, the Metal Parts Enterprise for the Textile Industry, the Iasi Heavy Equipment Enterprise, Tehnofrig in Cluj-Napoca, and the Galati Steel Combine. Many other enterprises have expressed interest in the new process, only a few months after voicing a prudent restraint. I believe that the success is due to the convincing demonstrations made at the Polytechnical Institute, regarding the possibilities for implementing the method and its advantages.

The construction of the automated casting line and the adoption of the casting process in evacuated molds in less than one year are prestigious victories not only for the Polytechnical Institute, but for the entire Romanian industry. It proved that when there is a will there is a way, and that the solution of a critical problem can open vistas for the future. We, the staff, researchers, and students of the Polytechnical Institute dedicate our achievements to the glorious anniversary of the party, and we undertake the obligation to further introduce in our integrating activity all the new advances of science and technology, so as to promote the highest level of technical progress in our country's economy and industry.

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- END -

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19 August 1981

East Europe Report

SCIENTIFIC AFFAIRS

No. 711

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EAST EUROPE REPORT

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ACTIVITY OF INSTITUTE OF NUCLEAR PHYSICS DESCRIBED

Tirana ZERI I RINISE in Albanian 15 Jul 81 p 3

[Interview with Petrit Skendi, deputy director of the Institute of Nuclear Physics]

[Excerpts] Question: Over the years the Institute of Nuclear Physics has carried on a broad scientific research activity in cooperation with production centers and institutions and has made a great contribution to the solution of many problems facing production. Our readers would like to hear about some of the achievements of this institute.

Answer: One of the first achievements was the use of radioactive trackers in monitoring the drilling columns in oil wells and the extension and perfecting of the so-called nuclear logging process; these two methods are being used successfully by the petroleum geophysics enterprise in Patos. The institute has also directed its attention toward medicine where it has done good work in regard to the use of radioactive isotopes in the diagnosis of illnesses. On the basis of the results achieved two specialized clinics have been set up and are in operation. They are equipped with the latest technology and they are continuing their cooperation with the institute in the area of nuclear medicine.

In agriculture, radiation is used on seeds before planting in order to stimulate productivity and interesting results have been achieved in crops such as tomatoes, tobacco, beets, wheat, etc. Radiation is also used in selection work so as to get new varieties on the basis of the effect which the radiation has on embryo cells. In this activity there is cooperation among many agricultural research centers and stations and higher schools.

The results achieved in monitoring the dynamics of phosphate fertilisers marked with radioactive phosphorus (P-32) are interesting. Also of interest are the results of the monitoring of the dynamics of nitrogen fertilizers marked with stable nitrogen-15 detected by mass spectrometric techniques. Other results include the successful use of nuclear analytical methods such as activation by neutrons and fluorescent X-rays.

These two methods are in the category of instrumental methods. They are based on the assault of the nucleus of the atom or its electronic layer by bombarding with neutrons or gamma rays and they the quantitative determination of the element is made on the basis of the second radiation which is produced. The geology sector and, in particular, the geophysics enterprise in Tirana, are working closely with the institute on these methods which are widely used.

Interesting studies have been made on natural radioactivity and trackers have been used in regard to the problems of the sedimentology of the coast and the ports. The results dealing with the operations of the ports of Durres and Vlore have been received with interest and their economic importance has been appreciated. One might mention the work for the electronic radiation of polyethylene in order to achieve a material with improved physio-chemical properties which is needed for the electrical industry and in communications; the work in nuclear electronics to design and construct nuclear control devices for industry (the Maliq sugar factory, the glass factory, oil wells, etc.), a work in the area of hydrology and hydrogeology to study the movements of underground waters, etc.

Question: On the basis of the guidelines and duties set by the 8th plenum of the Central Committee of the party what concrete scientific work has the Institute of Nuclear Physics assumed at the present time? What are some of the directions in which this work has been concentrated this year?

Answer: The duties assigned by the 8th plenum of the party Central Committee are an extensive long-range program of work in the field of nuclear physics which envisages improved quality and new directions.

This year in the institute, groups of nuclear analytical methods are making an effort to expand the number of elements which are able to be determined at low content levels. Copper, iron, chrome, manganese, nitrogen, rare soils, mercury, etc., are some of the elements in regard to which nuclear methods have had noticeable successes over chemicals.

The institute has progressive computing technology, using small computers for the automation of the processing of spectrums in analytical measures, which considerably increases the effectiveness of nuclear analytical methods.

Work on the stable nitrogen isotope for fertilizers is being expanded.

In the nuclear eletronics group some measurement and control apparatuses are under construction and work is being done to expand the knowledge of microelectronics and integrated circuits of a high level. On the basis of good experimental material, work is being done to reach conclusions on the advantages of radiation in preserving food products.

Studies on the physical aspects of the methods of recording radiation in order to achieve exact measurements of radioactive isotopes are being expanded.

The institute has a work plan on the development of laser physics in Albania, an area with great applicational value, and the first organizational measures are being taken to raise neutron physics to a new qualitative level, anticipating the construction of an experimental reactor in the country.

Many applications in industry, geology and other areas are in the work plan for this year.

Question: What is the involvement of young specialists and of the youth in general in the application of new nuclear methods in production. What are their duties?

Answer: I believe that two ancillary elements ensure the success of work in nuclear physics: a good knowledge of mathematics and skill in experimental work, and especially, in electronics. These are two fields in which the great pace of development can be met only by the sound and fresh ideas of the youth. I believe that stronger ties between the institute and the university faculties, especially, the branches of physics and electronics, will be helpful. The largest number possible of young students from the faculties of natural sciences and engineering should come to the institute to prepare for their degrees and course work in the field of nuclear methods which have become truly universal in their use.

CSO: 2102/5

STATUS OF COMPUTER DEVELOPMENT REVIEWED

Prague VYBER INFORMACI in Czech No 1, 1981 pp 3-36

[Article: "Data Processing Equipment in Bulgaria"; text sections, figures and tables renumbered]

[Text] 1. The Status and Development of Electronic Data Processing Equipment in Bulgaria

Our experience with the use of data processing equipment in the 1960's indicated to us that this equipment operates most effectively when the machines used in automated systems are program and device compatible. Only these progressive principles guarantee interchangeability of both individual devices and entire systems. The design of such unified systems, however, requires major expenditures on development, design, production and technical maintenance of the equipment used. The Bulgarian People's Republic does not have such resources. Accordingly, Bulgaria did not begin the development, production and application of electronic data processing equipment in earnest until 1969, after the JSEP [Unified System of Electronic Computers] was created.

The leading body for the development, production, export and technical servicing of computers and accounting equipment is the state economic association ISOT in the Ministry of Electrical Engineering and Electronics. The Institute of Data Processing Equipment, a part of ISOT, is in charge of most research work and also of design capacities for the data processing and accounting equipment sector.

Fig. 1. The EC 1022 B computer has been in series production since 1976.

1.1. Main Directions in the Development of Electronic Data Processing Equipment in Bulgaria

1.1.1 Electronic Data Processing Equipment (Mainframe Computers, Control Units, Small Computers)

The development of data processing equipment is taking several main directions in Bulgaria. The first of these consists of the development and production of systems of electronic machines. Within the Unified System, Bulgaria produced the EC 1020 B computer jointly with the Soviet Union between 1972 and 1977. Since 1976 it has been producing the EC 1022 B on the basis of Soviet specifications. This computer exists in three variants which different main memory capacities of 128, 256 and 512 Kbyte. The user can attach various peripheral devices via a multiplex channel and two selector channels. The EC 2622 mainframe computer differs from the EC 2620 by having a higher operating speed (up to 100,000 operations per second), a larger main memory (512 Kbyte) and a faster channel speed. This means that it can be connected to peripherals with higher operating speed and greater memory capacity.

The EC 1022 B operates under the control of the DOS/ES operating system. But when using the EC 1022 B, the user may also employ the OS/ES system. As the range of applications of the Unified System is expanded, program packages for various purposes are being refined. Last year, production of the new EC 1035 computer, which belongs to Series II of the Unified System, was begun using Soviet documentation. In comparison with the EC 1022 B, the EC 1035 has a much more extensive capabilities and embodies fundamental innovations in architecture, engineering and manufacture. The EC 2635 mainframe, for example, has a higher speed (three times that of the EC 1022 B), a larger main memory (1 Mbyte), and virtual memory. Virtual memory enables the user to operate with a maximum capacity of 16 Mbyte in 16 programs. In addition, microprogrammed emulation of the Minsk 32 computer is being prepared.

Fig. 2. Program testing on the EC 1035. The EC 2635 mainframe unit has been in production in the Sofia Data Processing Equipment Plant (ZIT) since 1979.

The EC 1035's more extensive instruction set (compared to Series I of the Unified System) increases operating capabilities. It also features block multiplex operation of selector channels. This means that the peripherals engage the mainframe only while exchanging data with working memory.

The equipment's diagnostic capabilities and reliability have been substantially improved. The channel speed makes it possible to connect new peripherals such as 100 and 200 Mbyte disk systems, magnetic tape systems with higher recording density and the like.

The second aspect of this first main direction is the production of control units. These devices control rapid access memory using magnetic media (tapes and disks). The EC 5561 control unit was designed to control the EC 5061 replaceable-disk storage unit. The selector channels of the EC 1022 B and the disk storage unit are connected by a standard interface which operates under microprogram control and can control eight disk units plus external storage simultaneously. The EC 5561 allows exchange of data between the channel and disk store and monitors the information transferred. The data format is in accordance with ISO requirements. A cyclic code is used to monitor the information transmitted. In standalone operation, the EC 5561 allows independent diagnosis of disk memory units. The EC 5561 control unit, together with the requisite number of disk storage units, enables the computer system to operate with either DOS/ES or OS/ES.

The EC 5512 control unit is used to control magnetic tape storage devices and is connected to selector channels by a standard interface. This unit controls eight EC 5012 magnetic tape storage units with tape speeds of 2 m/sec and 9-track recording. Data can be read when the tape is moving in either direction. The data are monitored by three methods simultaneously. The EC 5512 can be switched to stand-alone operation using built-in features.

The third aspect of the first production series is small computers. The ISOT 310 small computer was developed in Bulgaria, and its production has been begun. This general-purpose computer is designed, among other things, for scientific and technical calculations, for real-time automatic control of production processes, for primary processing of economic data, for remote control and for data processing. It may be used as a component of more complex hierarchical systems.

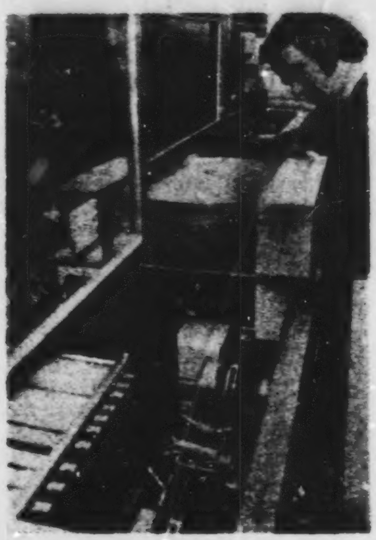

Fig. 3. The ISOT 310, a general-purpose small computer or component of a hierarchical computer system.

The ISOT 310 has rapid-access memory, an extensive and powerful instruction set and a flexible I/O system. This gives it high operating speed and the possibility of adding on magnetic tape and disk storage units, punched card readers, printers, analog-digital converters, displays, plotters and the like.

Modular system design makes it possible to expand the configuration by simple adding on of supplementary units. The main memory, with a capacity of 4K 12-bit words and a 2 microsecond access cycle, can be expanded to 128K words in 4K increments.

The set of programs for the ISOT 310 enables it to operate in combination with equipment of a higher class (computers).

Production of the CM 4 computer of the SMEP series [System of Small Electronic Computers] is currently being prepared. Series production is to begin this year.

1.1.2 Peripheral Devices

The second main direction consists of the development and production of peripheral memory units, of the tape, fixed-disk and replaceable-disk types. The EC 5012 magnetic disk storage unit was the first Bulgarian-produced device in the Unified System. It underwent joint tests and was put into series production at the end of 1971. Currently the EC 5012-03 modification of this device is in production. It is of light design, which makes it easy to handle each modular block in installation and repair, and affords higher operating reliability, a 3 m/sec tape speed and a rewind time of 120 seconds. Semiautomatic tape setup decreases the average time required to replace a tape to 1 minute. The EC 5012-02 modification, with a high tape speed of 3 m/sec, was developed from the same machine, and uses the NRZ I recording system and phase coding.

The development of the EC 5003 tape drive has been completed, and production will begin this year. Phase coding is used as the recording method. In addition, it also uses the NRD I recording method, which makes it possible to exchange information with other memory units that use this recording method.

The EC 5003 tape drive is connected by a diagnostic interface to the control unit and transmits 10 bytes of detailed information for memory unit diagnosis. The tape speed is 5 m/sec, which allows a high transmission rate of 315 kbyte/sec. The rewind time is 45 seconds. Automatic tape setup results in a considerable decrease in the time required for changing reels and eliminates damage to the tape. A glass window in the front opening is raised and lowered automatically. The fixed magnetic head cover and the fact that the magnetic tape comes into contact only with the magnetic heads and the tape cleaner are additional advantages of this device.

There are two modifications: the basic modification, the EC 5003, which is connected to the Czechoslovak EC 5503 control unit, and a supplementary modification with a tape speed of 3 m/sec (EC 5003-03), which operates with the Soviet EC 5525 control unit.

The EC 5052 and EC 5061 disk pack storage units are the best-known models.

This year the production of a new generation of disk units will begin. The first of these is the EC 5067-01 unit (the EC 5067-01 has a capacity of 100 Mbyte, the EC 5067-02 a capacity of 2 x 100 Mbyte, and the EC 5067 a capacity of 200 Mbyte). It is designed for use in a system of computers from Series II of the Unified System, or in configurations equivalent to this system. The disk drive may be designed for use with either the EC 5567 control unit or the EC 5667 control module, or with the EC 5667 control module alone (in integrated combination).

The EC 5067-01 consists of two independent drive units, each of which reads from or records on an EC 5266, IBM 3336, Mark 10 or equivalent disk pack. The disk packs are replaceable. Information recorded on one of the drives can be read by either the second drive or by another disk storage unit of the same type.

Local control and indication of machine condition is done at two control consoles.

The EC 5067-01 allows the following basic operations: positioning, recording, reading, and response to commands from the control unit or control module. Recording and reading are done by means of so-called "floating magnetic heads" made of ceramic. The disk store has a total capacity of 100 Mbyte and an average access time of 30 ms. The transmission speed is 806 kbyte/sec, and the recording density on the 000 cylinder is 106 bits/mm.

Several types of removable disk packs are produced in Bulgaria: the EC 5053, EC 5261 and EC 5269 A. This year, production of the EC 5267 disk pack, with a capacity of 100 Mbyte, will begin. It is intended for use with the EC 5066, EC 5067, EC 5067-01 and EC 5067-02 and with other disk storage devices of the same type. This disk pack contains 10 working disks, including one service side and 19 working sides, and complies with all requirements of the ISO. Its production is so oragnized that the disk packs can be manufactured to purchaser specifications.

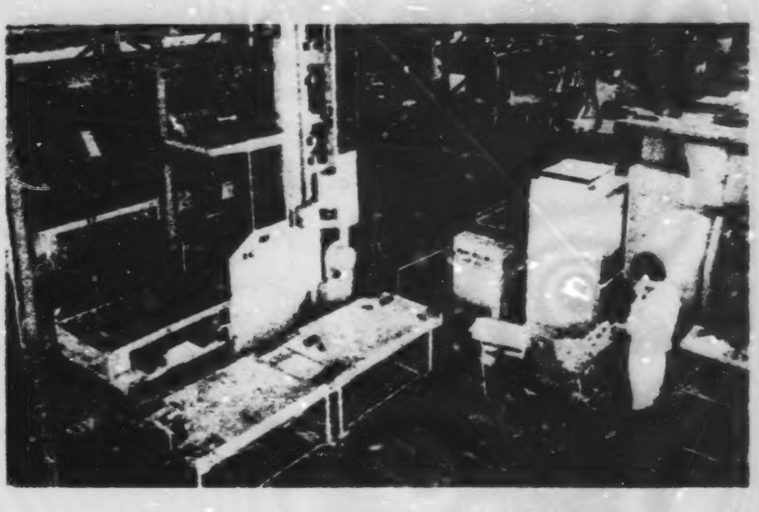

Fig. 4. Increasingly modern computer equipment is being introduced for production control in the Bulgarian People's Republic.

Particular attention is still being devoted to the development and production of external storage for small computers in the SMEP series. Currently three types of magnetic tape storage units are being produced: the ISOT 5003, with a tape speed of 0.32 m/sec and a 12-kHz transmission band, the ISOT 5005, with a tape speed of 0.65 m/sec and a 16-kHz transmission band, and the ISOT 5004 (CM 5300) with a tape speed of 0.32 m/sec and a 2-kHz transmission band. All of these have a recording density of 32 bits/mm and a reel diameter of 267 mm and use the NRZ recording method.

The ISOT 1370 small disk storage unit has a capacity of 6 Mbyte, 4 disk sides, a 2.5 MHz transmission band, an average access time of 55 msec and a recording density of 90 bits/mm. The development of two other small disk storage units with capacities of 3 and 12 Mbyte is close to completion.

The CM 5400 disk pack memory, an improvement of the ISOT 1370, is being produced for the small computer series. It is used for recording, storing and reading out information while functioning as external storage for the CM 1, Cm 2, CM 3 and CM 4 small computer systems. Up to 4 storage units can be connected radially or serially to one control unit. These storage devices (the ISOT 1370 and the CM 5400) use EC 5269 A disk packs, which have been in production in Bulgaria since 1975.

In addition, Bulgaria is producing a floppy-disk memory with a capacity of 3.2×10^6 bits.

1.1.3 Data Collection Units

In recent years, the quantity of data earmarked for electronic processing has been increasing greatly, and accordingly Bulgaria has developed the EC 9002 magnetic tape data collection unit using small magnetic tape drives. Development of two other microprocessor-based data collection units has been completed; these are the EC 9112 which records the data on floppy disks and the EC 9113 with output via the ISOT 5003 magnetic tape unit.

The EC 9003 system includes a card punch and controller, a paper tape punch, or certain other devices used for data collection and recording. The system increases operator labor productivity by 40 to 45 percent over that achieved with keypunch units. The computer provides the "intelligence" which the stand-alone device needs for direct recording on magnetic tape. The data entry stations are equipped with a keyboard and display. Information entry formatting, real-time monitoring, automatic operation, automatic addition of identifiers, reformatting and other system capabilities included in software simplify the operator's work and increase data entry productivity. Printed reports on the condition of the system and operator productivity make possible flexible operation and a continuous data recording process.

1.1.4 Equipment for Teleprocessing

Directly associated with electronic data processing are the ESTEL teleprocessing systems: they comprise a variety of teleprocessing systems consisting of hardware and software developed outside the Unified System. The program compatibility of various models, the uniformity of information codes, standard unified data processing system interfaces and transmission equipment developed in accordance with the CCITT recommendations create the conditions for flexible organization of a system for a variety of uses. All of these factors give the unified electronic data processing system an extensive range of usability in sectors which require information processing, for example in planning and assignment work, design and scientific activity, and in the control of production processes, in scientific institutes, economic associations, ministries and the like.

1.1.5 Microprocessors

The ISOT 0250 automatic accounting and invoicing unit uses MOS LSI circuitry. When it is used in combination with diskettes, the information can be further processed in SMEP computers.

The ISOT 1002 C automatic text processor is also microprocessor-based. This allows setting up and correction of texts, compilation of documents according to standard text samples, and duplication of the recorded text. It also has the following capabilities: correspondence, text search in external memory, and automatic formatting of the text to be printed out.

The ISOT P 220 microcomputer was developed to utilize the advantages of microprocessors. It is intended, for example, for the design and development of systems for primary processing of data, control units for peripheral devices, and units for controlling manufacturing processes and automatic testing devices.

The ISOT 0220 microcomputer has modular structure, which increases its flexibility and applications capabilities. It consists of the following modules: microprocessor module, I/O module, main storage module, and ROM module.

An arrival and departure monitoring system has also been developed from the ISOT 0220. This automatic system monitors enterprises or institutes with up to 6,500 employees. It produces reports on arrivals and departures of each employee in each calendar day.

1.1.6 Electronic Pocket or Desktop Calculators

Bulgaria was the first socialist country to produce and export pocket and desktop models of electronic calculators.

The ELKA 105 and ELKA 131 pocket calculators for economic calculations and the ELKA 135 for engineering and technical calculations are attracting interest.

Among desktop calculators, we should mention the ELKA 35 with a printer and the ELKA 58 with a digital display and a small printer. They are intended for performance of a wide range of mathematical, engineering-technical, scientific and practical tasks.

Considerable attention has been devoted in Bulgaria to developing cash registers and putting them into production. For example, the ELKA 89 electronic cash register is used for processing and recording economic information.

There are two modes of operation: stand-alone and off-line.

The ISOT 310 minicomputer is used as the mainframe in the off-line variant. The VMK 212 module [kazeta] is used for connection to the computer. The cash registers are used in shops in the retail network, restaurants, department stores and the like. The electronic cash registers are based on a system consisting of the ISOT 500 microprocessor and TTL circuitry.

1.1.7 Manufacturing Systems and Equipment

Several manufacturing systems are available in Bulgaria for automating production.

For example, the EC A 527 set of control disks, now in production, allows quantitative evaluation of the dynamic imbalance of disk drive spindles.

A small computer, an adapter interface and a specialized control unit make up the system which Bulgarian specialists have developed for final testing of magnetic disk storage units or disk packs in production conditions.

The Senk 0310 system is used to automate the most basic work in the construction of digital devices, the making of wiring connections. This system makes it possible to replace manual wrapping [navijeni] of the connections with semiautomated wrapping, which increases the quality, speed and reliability of installation. The system consists of the ISOT 310 minicomputer, the S 103 group control unit, a semiautomatic wire wrapping unit with two-axis positioning, a paper tape reader and a printer.

This work represents only a small part of the overall electronic data processing equipment work being done in the Bulgarian People's Republic.

Production relies on a high level of specialization and cooperation, on the introduction of mechanization and automation facilities, and on a purposeful attitude on the part of scientific and technical personnel.

2. Microprocessor Systems

Microprocessors can be used in the design of more narrowly specialized systems. They lack such disadvantages of specialized LSI circuits as long design time, high development costs and the like. The time required to develop a new microprocessor system is only a fraction of that required for specially designed logic. The great advantages of microprocessors in the design of systems have gained them extremely extensive use in all areas of the economy: data processing equipment, electronic accounting equipment, machine design, trade, transport, industry, science, and domestic electrical consumption.

In many cases, microprocessors can replace small computers, particularly in small or medium-sized systems. In addition, microprocessors are an order of magnitude cheaper and considerably more reliable. The introduction and production of the CM 600 group of microprocessors and small peripheral devices in Bulgaria laid the groundwork for Bulgaria to become one of the main producers of microprocessor systems among the CEMA member states.

2.1. The ISOT 0250 Economic Data Processing System

The ISOT 0250 automatic accounting and invoicing unit is used in large information systems to collect and perform primary processing of economic data at the point of origin. It also acts as an independent unit for data processing in small and medium sized enterprises and institutes. All input data are recorded in floppy disk memory.

The ISOT 0250 system includes:

—a microprocessor-based central control unit with 12 Kbyte working memory for data and programs,

—an alphanumeric, digital and functional keyboard,

—digital and functional indication,

—an EC 7187 printer,

—an EC 5074 disk storage unit with two drives.

The following basic operating modes are possible in the ISOT 0250 system:

—entry into working storage from the keyboard of a program written in a problem-oriented language and its conversion to machine language,

—testing of the program by means of specified examples,

—transfer of the program into diskette storage,

—entry of input data and constants into working memory and transfer to diskette storage,

—execution of the program recorded on floppy disk, thus obtaining the required results.

The ISOT 0250 system was used as the basis for developing systems for planning and managing work in industrial enterprises and industrial agricultural complexes. The set of application programs for industrial enterprises includes:

—quantitative and qualitative accounting for commodities, and sales accounting by customer,

—automatic preparation of dispatching documents,

—maintenance of accounts receivable and payable,

—automatic composition of process documents and automatic retrieval of work orders with data on labor time and materials,

--preparation of materials consumption sheets and monitoring of adherence to prescribed limits,

--monitoring of production plan fulfillment and preparation of daily, weekly, monthly and quarterly reports.

The system developed for planning and management of agricultural activities includes:

--drawing up of plans and reports on their fulfillment,

--comparison of the plan with accounting reports, yielding data on the results of agricultural work,

--accounting work, including materials documentation, calculation and record keeping on amortization, and preparation of statements for the bank,

--documentation of agricultural products produced and sold,

--documentation and planning for the machinery inventory,

--calculation of wages and the like.

2.2. The ISOT 1002 C Text Processing System

One of the newest and most promising areas of microprocessor utilization is text processing.

The ISOT 1002 C text processing system is intended for compilation, editing and duplication of text. In addition to traditional editing work, the following functions can be performed:

--deletion of passages,

--insertion of text,

--replacement of text,

--tabulation,

--centering of text,

--document search,

--combining of documents,

--compilation of documents from standard text passages.

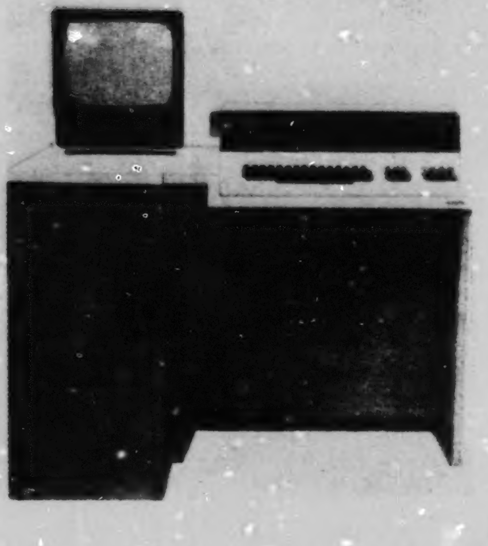

Fig. 5. The ISOT 1002 C text processing system.

Information inputs are monitored and information displayed on 24-line, 80-character displays; the format of the information displayed can be programmed in advance according to user needs. A cursor controlled from the keyboard gives coverage of the entire displayed text, indicating the location at which correction is to be made.

The EC 7187 alphanumeric printer gives good, high-quality printing. By changing the type face it is possible to print in either the Latin or Cyrillic alphabet.

The information supplied is stored on diskettes and can be reused for duplication or correction.

The ISOT 1002 C system includes:

—a microprocessor system and control console,

—an EC 5074 floppy disk unit with two drives,

—an EC 7187 alphanumeric type printer,

—a monitor to display the information entered.

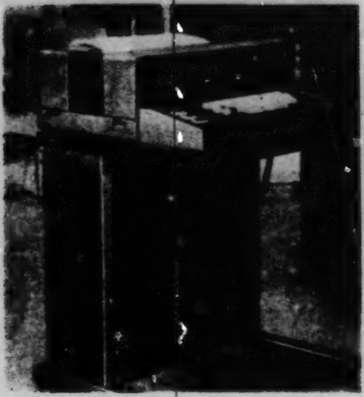

Fig. 6. The ISOT 0232 control console.

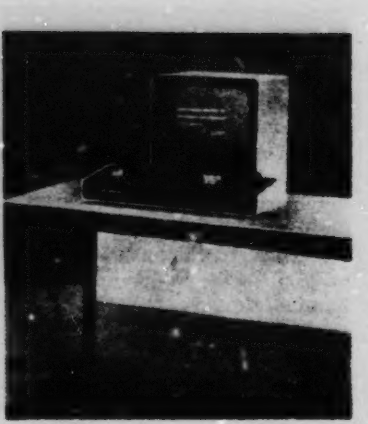

Fig. 7. The WKP 171 display.

2.3. The EC 9112 Data Collection Unit

The EC 9112 data collection unit may be used in computer centers and enterprises and the like for data collection on floppy disks. In addition to performing the traditional functions assigned to punched cards, punched tape and magnetic tape devices, the EC 9112 unit offers the following capabilities:

—location of a block by its address, location of the end of data,

—copying,

—addition (entry) of blocks,

—monitoring,

—diagnostics,

—preparation of head-of-list entries,

—work with a program sequence.

The advantages of the floppy disk data collection unit as compared with the data collection equipment used hitherto are:

—extensive capabilities available to the programmer,

—possibility of adding one or more keyboards with minimal increase in the size of the unit,

—more flexibility in data entry.

The EC 9112 data collection unit includes:

—a microprocessor system and control console,

—an EC 5074 floppy disk storage unit with two drives,

—a monitor to display the information entered.

The development and rapid beginning of production of the systems provides the groundwork for automatic control and administrative work, commercial activity and work with Bulgaria's finances using modern equipment.

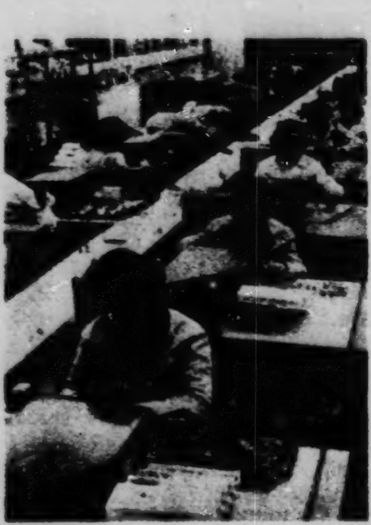

Fig. 8. Printed circuit boards are assembled and tested in this plant in the north Bulgarian city of Russe. The enterprise is an important subsupplier for computer production.

3. Development of Replaceable-Disk Memory

The first replaceable-disk storage unit in the Unified System, the EC 5052, with a capacity of 7.25 Mbyte, was developed in 1970. Series production began in 1971. This storage unit has gone through several modifications since that time. In addition, the EC 5061 replaceable-disk storage unit, the ISOT 1370 small disk storage unit and the EC 5074 diskette storage unit have been produced or are in production.

Fig. 9. The first replaceable-disk storage unit in the Unified System, the EC 5052 with a capacity of 7.25 Mbyte.

In 1978, progress in replaceable-disk storage in Bulgaria resulted in the development of the EC 5067-02 storage unit, which has a capacity of 2 x 100 Mbyte. This storage unit combines new manufacturing and operating principles with large capacity, high data transmission speeds, a satisfactory access time, high reliability, and ease of operation.

The first EC 5067-02 storage units with a capacity of 2 x 100 Mbyte are already in series production. In the meantime, however, the developers have produced the EC 5067 replaceable-disk storage unit, with a capacity of 200 Mbytes (in a single disk pack). Both units operate with the EC 5667 control module and the EC 5567 control unit. They can be included in the system configuration of all Series II Unified System computers as direct access storage devices.

3.1. New Technology for the Production of Replaceable-Disk Storage Units

The development of future replaceable-disk storage units will have to meet the following requirements:

—higher capacity,

—higher reliability,

—better support to the user,

—usability in a wider range of environmental conditions,

—lower cost.

Information module technology (interchangeable and noninterchangeable information modules) appears to be a way of meeting these requirements.

In the near future, the following main tasks must be accomplished:

—use of a hermetically sealed module as part of the disk pack,

—development of new head types (using semiconductor technology),

—mastery of new methods of coding information on the working surfaces and increasing the recording density and number of tracks,

—increasing recording speed and data transmission capacity.

The recording density on modern disk surfaces can be increased by 20 to 30 percent without any alterations. But the production of higher-precision surfaces (with a uniform distribution of magnetic particles) with a suitable surface smoothness could make it possible to achieve a limit of 400 bits/mm and 40 tracks/mm by decreasing the distance between the head and the surface.

The weight and dimensions of the magnetic heads are being decreased. Problems will include not only amplifying the weak signal read from the surface (against practically constant noise), but also the effect of changes in signal amplitude resulting from nonuniform head movement. The design and low weight (less than 10 grams) allow safe positioning and raising of the heads.

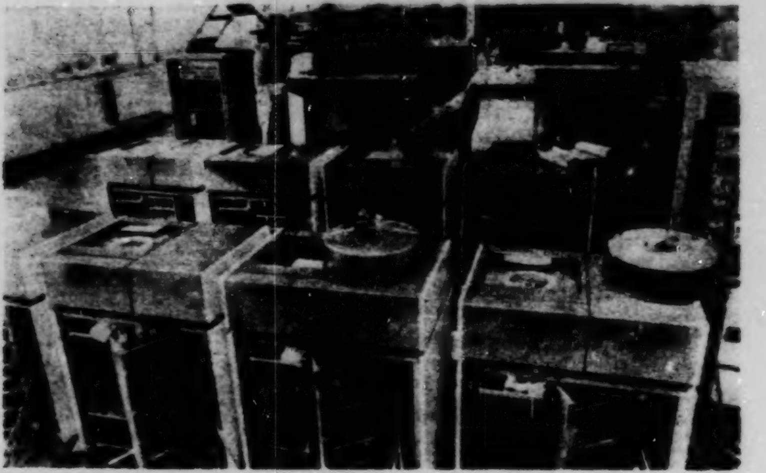

Fig. 10. Testing of EC 5061 disk pack storage unit with a capacity of 29 Mbyte in the Data Processing Equipment Plant in Sofia.

Modern servosystems of disk pack memories with electronic head positioning use servoheads with a set of 20 to 30 read and write heads. If precise tracking of the midlines of the tracks is performed only on the servosurface, the radial alignment becomes increasingly important for all the other heads, particularly in case of high track density. Two possibilities for solving this problem suggest themselves:

—design of nonremovable information modules,

—use of universal read/write heads for reading the servoinformation on the track as well as data.

The only possibility for increasing the recording density within the track is an optimal combination of coding method and error correction code. Coding methods in which each remagnetization would correspond to more than 1 bit are being sought.

A suitable error correction code would ultimately increase both the recording density (capacity) of the track and its reliability, in spite of the small area on the track for control and correction information.

Increasing the capacity in the case of replaceable disks must not be considered separately from the system in which the storage unit ts to operate.

The reliability of replaceable-disk memory is being increased by means of microprocessors which control not only the interface but the servosystem and error diagnosis and elimination.

There are certain uses of small computers which make fundamental demands on small disk storage, such as:

—compact design so that the devices can be installed in standard housings,

—usability in non-climate-controlled areas,

—simplicity of operation, high reliability and low cost.

In order to meet a variety of user requirements, there are two groups of small disk storage units: cartridge memory with a capacity of 6, 12 or 24 Mbyte, and disk storage modules with replaceable disks and with capacities up to 80 Mbyte.

The third group of storage units for small computers is those with floppy disks, which are also being further developed as regards capacity and transmission capacity.

In the future these storage units will have a standardized mechanical design and modular electromechanical assemblies. This objective is economically beneficial for both use and production.

Another innovation is buffer memory located between the control unit and the disk storage unit. Such memory units have small capacity, but they can be used to increase the productivity of the disk subsystem by an order of magnitude, while requiring no changes in the devices themselves; i.e. complete software compatibility is maintained.

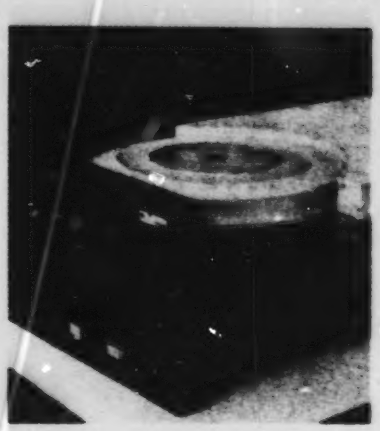

Fig. 11. The ISOT 1370 replaceable disk storage unit has a capacity of 6 Mbyte.

3.2. Structure and Function of the EC 5067-02 Disk Pack Storage Unit

The main innovation in this storage unit is the placement of the working surface on a set of platters. The data recorded on the working surface are used to:

--carry out head magnetization and demagnetization operations and regeneration instructions,

--generate (cylinder) count pulses during the search operation,

--carry out head displacement operations,

--monitor the angular position of the disk pack,

--emit an index signal,

--synchronize data during the recording operation.

We will consider three of these uses of servosignals. The displacement operation was introduced in order to increase memory reliability. If the data are incorrectly played back during reading, a series of attempts to read them are made, during which the heads are displaced up to 40 microns to either side of the center lines of the tracks. In this way, "soft" errors are corrected and possible inaccuracies in the radial alignment of the heads are compensated. Displacement is ruled out in the recording (writing) operation.

The data can be placed on the tracks in the form of records, whose number and length may vary. The time between the index pulse and the performance of the required entry onto the track is known as the "wait time." To decrease this time interval and allow the central processor to carry out other operations, monitoring of the angular position of the disk pack has been instituted in replaceable-disk memory.

The disk pack is arbitrarily divided into 128 identical sectors, each of which has a length of 105 bytes (13,440/128 = 105). Two serially connected counters participate in forming the sector address (from 000 to 127): the servopulse counter and the sector counter.

If the period following passage over the servopulses amounts to 2,480 microseconds, this would correspond to 52.5 pulses per sector. In order to avoid this problem, a division is made into even sectors containing 53 servopulses (from 0 to 52) and odd sectors containing 52 pulses (from 1 to 52). Each output pulse from the servopulse counter increases the contents of the sector counter by 1. Both counters are erased by the index signal. Replaceable-disk storage contains a flip-flop ("second half of sector") which is set at 1 after each 23d pulse. This produces information on a smaller time interval than that represented by the sector.

If all records on a given track are the same length, it is possible to calculate the addresses of the sectors in which the records begin. In this case a 113 (115 - 2) is entered in the sector address register. When the contents of the sector counter reaches 113, an interrupt signal is fed to the control module. The time corresponding to the passage through two sectors (in this case from 113 to 115) is always specified so that the central processor can interrupt the operation which it is performing and prepare to receive the data recorded from record No 20.

The duration of the passage through each sector is about 130 microseconds.

The index signal is a sequence of binary 1's and 0's in the servoband with the following coding: 11 01 01 10 (in protection bands, the index signal is also generated, but with a binary 1). This sequence is present on all bands in the disk pack and forms a very narrow cylindrical sector in the pack.

To eliminate spurious generation of index signals, this sequence can be decoded only during the 50th, 51st and 52nd servopulses of sector 127 and the 0th, 1st, 2nd and 3d pulses of sector 0 (the so-called "index window").

Fig. 12. Data recording in the EC 5067-02.

The modified frequency modulation recording method allows high recording density. The records change length in accordance with the cylinder number, with allowance made for differences in the behavior of the heads. Preliminary compensation during recording decreases the effect of phase errors with different code combinations.

Another innovation in replaceable-disk memory is the monitor, which monitors correct performance of the basic operations in memory. These operations correspond to seven different monitor operating modes: head magnetization and demagnetization, regeneration, search, end of search, extraction, recording, and sequencing.

Each mode is further divided into eight states. When the operations are performed correctly in the disk unit, these states are activated in order. If one of them appears before the previous state is activated, the flip-flop [klopny] monitor is set at 1.

To monitor the condition of the disk store, there is a so-called "diagnostic register" (three filp-flop circuits) in which one data item is entered via the BU 1-3 by means of instruction 12. This datum specifies six diagnostic modes. The circuits to be diagnosed have separate inputs which are independent of the inputs activated during normal operation.

The interface with the disk store which is used, namely the control module, differs in organization from that in the 7.5 Mbyte and 29 Mbyte disk storage units.

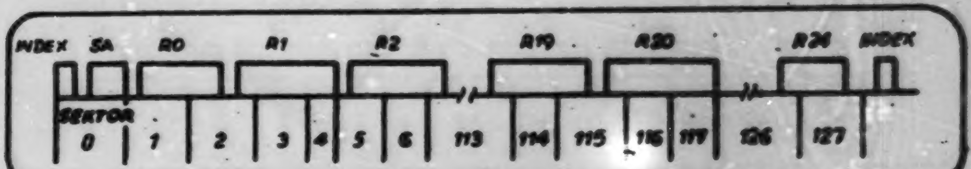

Fig. 12

Fig. 13

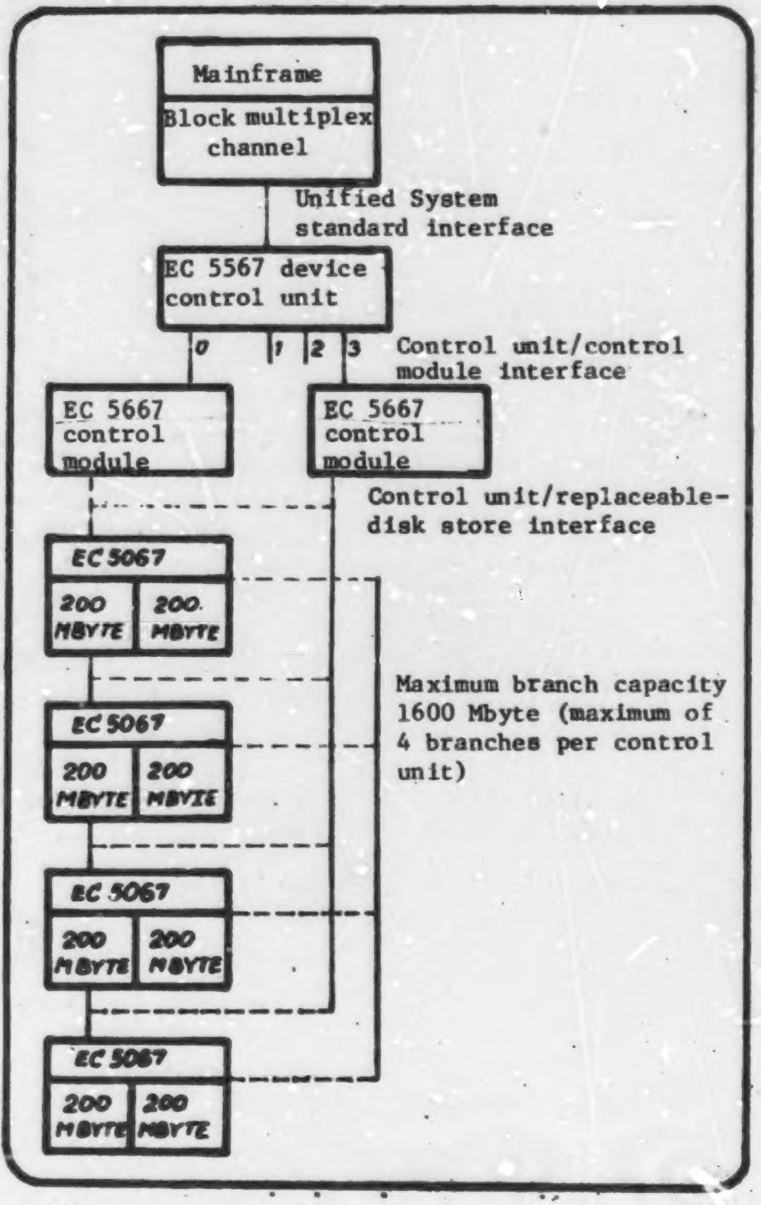
Mainframe
Block multiplex channel
Unified System standard interface
EC 5567 device control unit
0
1
2
3
Control unit/control module interface
EC 5667 control module
EC 5667 control module
Control unit/replaceable-disk store interface
EC 5067
200 MBYTE
200 MBYTE
EC 5067
200 MBYTE
200 MBYTE
EC 5067
200 MBYTE
200 MBYTE
EC 5067
200 MBYTE
200 MBYTE
Maximum branch capacity 1600 Mbyte (maximum of 4 branches per control unit)

Fig. 13. The replaceable-disk storage subsystem consisting of the EC 5567, EC 5667 and EC 5067.

The individual buses and channels have the following tasks:

—the identification buses (ID BUS) consist of multiplex channels which carry commands (or characters) from the control device to the replaceable-disk store and specify the commands which the memory unit is to execute;

—the control byte buses (BU BUS) consist of multiplex channels which carry signals from the control module to the storage unit and which, together with the signals transmitted by the identification buses, specify the required commands and addresses;

—the triggering (command) channel of the ID bus is a multiplex channel which permits the characters to be decoded;

—the disk store select channel is a multiplex channel which selects a specific disk store from those connected to the control module;

—the sequence channel is a bus which carries the signal that turns on the spindle motors of the individual storage units in the proper order;

—the control bus carries the signal for the heads to be inserted into the disk packs;

—the byte and response buses (BO BUS) are multiplex channels which carry information to the control module on the state of the storage unit or on the chosen address of the storage unit;

—the physical address buses are multiplex channels which carry to the control module the code (3 of 6) of the disk storage unit which is logically connected to it (one of the storage units that are physically connected to it);

—the replaceable-disk unit error channel is a multiplex channel which carries a signal when the storage unit is in an "error" state;

—the read-write data channel is a direct selector channel for bidirectional data transmission;

—the servodata channel is a selector channel which carries several servopulses to the control module during read operations in the disk store.

The interface control block decodes signals transmitted from the control module such as commands and addresses and generates response signals giving the status of the storage unit.

The error block monitors errors in the storage unit which might result in the erasing of valuable information in the disk pack, blocks the reception of input signals, blocks the record circuits, and emits the proper signal to the control module.

To decrease the channel wait time, the address can be transferred to the sector address register. This address is compared by the sector address register comparison module with the current sector address formed in the sector/index block. In addition, with each revolution the sector/index block generates, on the basis of information received from the servosurface a sector/index pulse giving the physical beginning of all tracks.

The address of the required cylinder is sent to the cylinder address register.

The address of the head required is fed to the head address register, which specifies the track within the cylinder in question.

The difference/count register receives the difference between the cylinder address at which the heads are located and the address of the required cylinder. During positioning of the head, the contents of this register are decreased as it passes through each cylinder.

The input control block contains the requisite commands and transforms them to signals to control the servosystem, which in turn controls the movement of the access arm and its precise positioning in the required cylinder.

The linear motor is the servosystem drive mechanism. It also has built into it a rotation sensor which emits signals proportional to the speed of movement of the access arm.

The diagnostic block tests the state of the storage unit and is used primarily for error diagnosis.

The mode-monitor block monitors the performance of the main disk store operations, using the information from a series of nodal points in the plug-in modules and blocks.

The control console is used to start and stop the storage unit and to control its activities.

The logic address box is used to insert the required address into any of the disk stores connected to the control module.

The mechanical blocking unit stores in the disk pack information on interventions by unauthorized persons.

The readout unit picks up the signals read by the head in question and forms them into output data (read data).

The record block receives from the control module the data to be recorded and carries out the recording operation using the selected head.

The head select block is used to physically connect the selected (single) head to the record or readout block.

The servodata block acquires data emitted by the servohead and transmits the information to the proper blocks for emission of sector and index signals, control of the servosystem and synchronization of the data during the write operation.

The head positioning block generates a pulse during passage through each cylinder, as well as a signal to position the heads in a given location with respect to the axis of the track.

Technical Data

Connection to EC 5667 control module	Small interface with four direct cables (selector cable) and a "railway" cable (multiplex cable)
Capacity of one disk pack	100 Mbyte
Number of spindles	2
Number of working sides per disk pack	19
Number of service sides per disk pack	1
Number of magnetic heads	20
Number of tracks per side (number of cylinders)	404 + 7 reserve
Rotary speed of disk pack	3,600 rpm
Recording method	MFM
Data transmission speed	806 kbyte/sec
Positioning time	
minimum	10 msec
average	30 msec
maximum	55 msec
Disk pack spinup time	Less than 20 msec
Disk pack stopping time	Less than 20 msec
Disk pack used	EC 5266
Power consumption	5 kW
Line voltage	3 N average 380/220 V ±15%
Line frequency	50±1 Hz

Main dimensions	
width	1190 mm
depth	960 mm
height	1145 mm
Weight	55 kg

Table 1. Technical data on Bulgarian replaceable-disk storage units

Parameter/device	EC 5052	EC 5061	EC 5067-01	EC 5067
Number of record and read heads	10	20	20	20
Capacity of unit (Mbyte)	7.25	29	100	200
Cylinder units	200	200	404 + 7	808 + 7
Maximum positioning time (msec)	95	80	55	55
RPM	2400	2400	3600	3600
Transmission speed (Mbyte/sec)	156	312	806	806
Recording density (bits/mm)	29-44	60-90	159	159
Units/control unit	8	8	8	8
Associated control unit	EC 5551 EC 5552 EC 5555 EC 5558	EC 5561	EC 5567 control unit EC 5667	EC 5567 control unit EC 5667

4. Collection of Primary Data on Magnetic Media

The data collection devices developed and produced in Bulgaria use the following data media: standard magnetic tape 12.7 mm wide with a recording density of 32 bits/mm, and floppy disks 8 inches in diameter.

Bulgaria's specialization in external storage using magnetic media is a solid basis for its rapid and successful solution of several problems which have arisen in the design and production of data collection devices. These are both purely technical problems (magnetic heads, noncontact keyboards, recording systems and the like) and problems of the optimal composition of the operator-data collection device-medium-computer system.

Magnetic tape has satisfactory capacity and good properties. In addition, it is produced by the socialist countries. It has no competitor as regards compatibility with the different external storage units of the digital computers in use in the countries participating in the unified system of data processing equipment.

The floppy disk is compact and reliable and permits random access. Its use as a data medium in small computers and microcomputers will expand considerably in the future.

The development of magnetic media in Bulgaria has been based on international experience with data entry on punched cards and tape.

4.1. The EC 9002 Magnetic Tape Data Collection Unit

The EC 9002 is the first device of this type produced in Bulgaria. The basic advantages of this device compared with card and tape punch units are the use of a buffer memory for data and the use of magnetic tape.

The high operating speed, current data display, quiet operation and simplicity of selection of the required operating mode or function all increase the efficiency of the device and its operator compared with conventional keyboard-type tape or card punch machines.

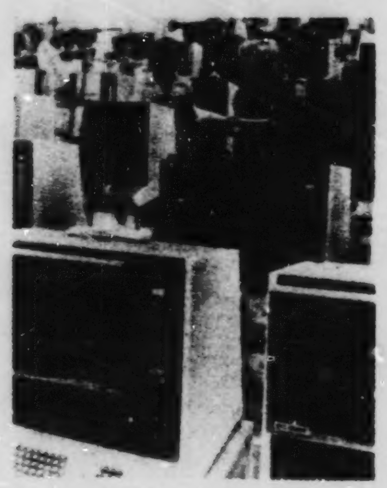

Fig. 14. The EC 9002 data collection devices produced in a storage unit plant in Plovdiv.

In addition to the basic product, the following modifications have also been developed:

—a unit which can be doubled (EC 9002-01),

—a device which prints (reads out) information from the tape (EC 9002-02).

The EC 9002 has been in large-series production for some years.

4.2. The EC 9003 Magnetic Tape Data Collection Unit

The EC 9003 can be considered a modernization of the EC 9002; the aim of its development was substantial improvement of the functional, design and applications capabilities.

The EC 9003 is equipped to display current data on the display unit. The Elektronika WL 100 and Junost 603 television receivers may also be used for display. The structure of the unit offers extreme flexibility as regards character assortment and recording density.

Fig. 15

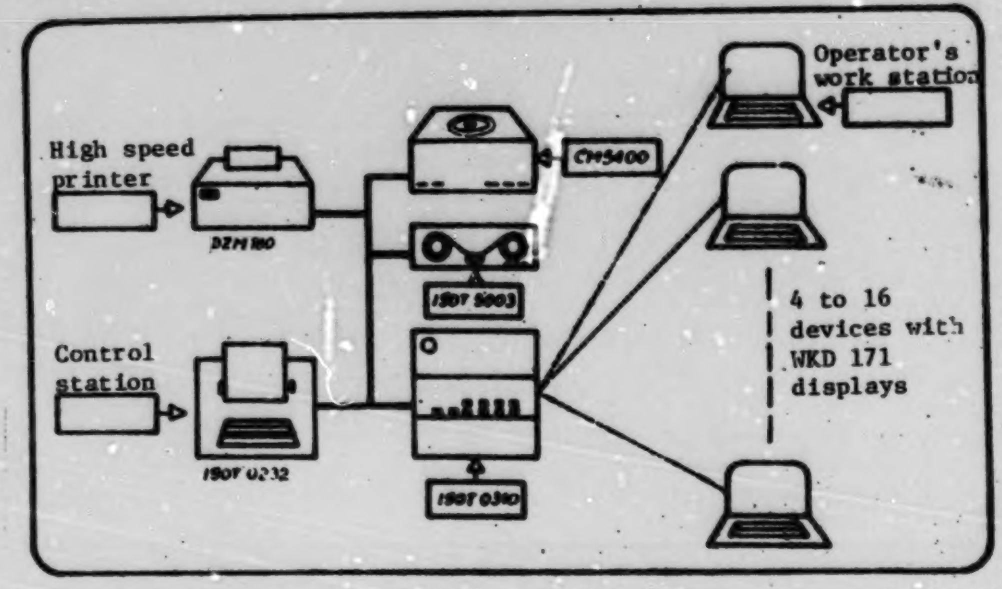
High speed printer
DZM180
CM5400
ISOT 5003
Control station
ISOT 0232
ISOT 0310
Operator's work statio
4 to 16 devices with WKD 171 displays

Fig. 15. Configuration of the EC 9003 magnetic tape data collection system.

At the user's request, additional functions such as "sum modulo 10," "sum modulo 11," and "sum of entire field" can be added to the EC 9003.

4.3. The EC 9004 Magnetic Tape Data Collection Unit

LSI circuitry, plug connections with improved parameters and a new tape drive mechanism were used in the EC 9004.

The design of the EC 9004 features a self-contained keyboard and smaller dimensions.

The structure of the EC 9004 makes it possible to add on numerous I/O units, thus considerably expanding the range of applications of the unit. The following modifications have been developed:

—output on EC 7187 printer (EC 9004-2),

—input from card reader (ISOT 6001, EC 9004-3),

—modem for data transmission over telephone lines (EC 9004-04H),

—input from a punched tape reader (EC 9004-5),

—output onto punched tape (EC 9004-06),

—floppy disk storage (EC 9004-07).

4.4. The EC 6901, EC 0112-01 and EC 9113 Floppy Disk Data Collection Units

In recent years Bulgaria has developed (and is systematically engaged in developing) data collection devices which use floppy disks as the data collection medium. Last April, joint tests of the EC 6901 floppy disk data collection unit were successfully concluded. The "zero series" of EC 9112-01 diskette units and EC 9118 converters for converting from diskette to magnetic tape was produced at the end of 1979. All of the products in this complex are designed around the CM 600 microprocessor system, They have modular structure and standard design.

The EC 9113 unit includes:

—a pedestal containing the keyboard and the electronics and power supply module,

—a housing containing two EC 5974 diskettes,

—a housing containing the ISOT 5003 magnetic tape storage unit,

—a monitor.

Thanks to microprocessor control, these devices and random-access external storage units significantly increase operator productivity in comparison with the EC 9002 and EC 9004.

4.5. The EC 9003 Magnetic Tape Data Collection System

The EC 9003 data collection system solves the complex problems associated with data entry and data set input into computers. The use of a general-purpose microprocessor also gives the system a high degree of "intelligence."

The EC 9003 system consists of the following components:

—the ISOT 310 central processor (module 1 and 2) and a memory of 32K [12-]bit words,

—the ISOT 5003 magnetic tape device with a speed of 32 cm/sec, a recording density of 32 bits/mm and the MZR I recording method,

—disk storage with a capacity of 60 Mbyte and a rotary speed of 1500 rpm (CM 5400),

—the ISOT 0232 control console,

—a DZM 180 serial matrix printer with a speed of 180 characters/sec and a line width of 132 characters,

—the EC 0101 16-key keyboard,

—a WKP 171 display with 128 lines and 32 characters per line.

Surveys have indicated that the use of these devices increases operator labor productivity by 40 to 120 percent compared with keypunch units. In addition, the considerable expenditures on data entry, which currently range from 30 to 50 percent of total expenditures on the digital computer equipment, are decreased.

Table 2. Technical data on the EC 9002 and EC 9004 data collection units.

Parameter	EC 9002	EC 9004
Type of buffer memory	Random access	Random access
Basic of modular components	TTL circuitry	TTL circuitry
Type of display	Character by character	Block by block
Type of tape drive mechanism		Single capstan
Recording density	32 bits/mm	8, 22 and 32 bits/mm
Temperature range	5-40°C	5-40°C
Weight	64 kg	48 kg
Dimensions	582 x 641 x 588 mm	582 x 641 x 588 mm

[Table 2. Continued]

Parameter	EC 9002	EC 9004
Reliability	1×10^7 bits	1×10^8 bits
Operating modes	Data input, monitoring and search; program entry and monitoring; input, monitoring and reading from buffer memory	

In spite of the fact that interactive processing shows the greatest promise, data entry for batch processing will predominate in certain applications. It is self-evident that this will require continual improvement of the technical and economic indicators of the individual auxiliary units. In Bulgaria the relevant work is proceeding in two main directions:

—optimization of the main-machine interface for data transcription with expanded functional capabilities, e.g. editing and processing,

—improvement of applications capabilities, particularly device reliability, through new design and manufacturing solutions.

Table 3. Basic parameters of the EC 9112-01 data collection device

Parameter	EC 9112-01
Number of programs	10
Reliability	1×10^7 characters
Mean time between failures	500 hours
Weight	133 kg
Functions	Input, processing, monitoring, search by address, search by content, search by end of data, search by adjacent content, search for beginning, aggregation, test aggregation, copying of small disks, copying of set of data in a particular block, operation with program strings, statistical work by operator

5. Reliable External Storage: Magnetic Tape Units

In recent years, Bulgaria has specialized in external storage. Jointly with the Soviet Union, it has quickly developed magnetic tape storage with modern technical parameters and begun its production. This equipment has large capacity and high efficiency (high transmission capacity, and short access time), and is reliable and safe to use. Its design meets esthetic and ergonomic requirements. Development of magnetic tape storage units in Bulgaria typically proceeds in two directions:

—large magnetic tape stores with tape speeds of 2 to 5 m/sec,

—smaller units with tape speeds of 0.3 to 2 m/sec.

The large magnetic tape storage units are developed as two groups based on two different designs. The first group is based on the EC 5012 magnetic tape unit and the other on the EC 5003. Small magnetic tape storage units have slower speeds and greater compactness.

The reliability and safety of magnetic tape devices will be improved in the future through a new method of recording which makes possible a higher data density on the magnetic tape (the GRC method for small magnetic tape storage devices), improved drive mechanism design, and the introduction of modern structural components and electronic circuits in the recording and reading channels.

5.1. Large Capacity Magnetic Tape Storage

The EC 5012, the first magnetic tape unit produced in Bulgaria, is being improved continually. As a light-weight device, it is used primarily in systems in Series I of the JSEP. The highest level of this design is the EC 5612 magnetic tape storage device, which has a tape speed of 3 m/sec and uses the PK/NRZ I recording system. In the unified system of data processing equipment, the EC 5612 magnetic tape store is used in subsystems with the EC 5525-03 controller.

Other devices based on the same design are the EC 5012-03 magnetic tape store, which has a tape speed of 3 m/sec and uses the NRZ I recording system, and the EC 5012-01 magnetic tape store with a tape speed of 2 m/sec, using the NRZ I recording system. These two devices operate in subsystems of the unified data processing equipment system with the EC 5517 or EC 5512 controllers.

The advantages of the second basic design, the EC 5003 are:

—automatic tape setup,

—high tape speed, up to 5 m/sec,

—short rewind time, 45 seconds,

—possibility of using cartridges,

—single capstan drive with a vacuum well,

—fixed magnetic head cover.

The device can be included in systems in Series I and II of the JSEP.

The highest level of this design is the EC 5003 magnetic tape storage unit, which has a tape speed of 5 m/sec, uses the PK/NRZ I recording system and has a multiplex diagnostic interface. In the unified system of data processing equipment, the EC 5003 is used in the subsystem with the EC 5503 controller and software of Series I of the Unified System.

The EC 5003-03 magnetic tape store uses the PK/NRZ I recording system and has a tape speed of 3 m/sec and a modified interface for operation in subsystems with the EC 5225 control unit. The interface can be changed by means of various interchangeable modules.

Both groups of large capacity magnetic tape storage devices were developed from single capstan tape drives with start-stop operation: the first variant with vertical and the second with horizontal heads.

Fig. 16. EC 5012 magnetic tape units in use as external storage for a JSEP 1 computer.

The vacuum wells are used to compensate variations in motor parameters, the single capstan drive and the reel motors during start and stop operations. Tape setup is automatic in the EC 5003 and semiautomatic in the EC 5012, using an end piece in the latter case.

The single capstan drive motor and the reel motors of the tape drive unit are controlled by digital servosystems. The motor servosystem in the single capstan drive is informed of the current tape speed by means of a rotation sensor mounted on the motor shaft.

The servosystem for the reel motors receives information on the position of the tape in the wells from sensors located in the wells.

The record head records data on the magnetic tape by means of electronic circuits in the recording channel.

The record channel in magnetic tape units with the combined PK/NRZ I recording system is an integrated circuit design using a type 7445 decoder.

Magnetic tape stores with the combined PK/NRZ I recording system have compensation of static shift of the byte being read. This feature, which is part of the overall control system of magnetic tape units of the EC 5003 series, allows simple changeover from one interface to another.

The following features are protected by patent:

—the modular structure of the EC 5003 unit,

—the control of the single capstan drive motor of the EC 5003/EC 5003-03 devices,

—the control of the reel motors of the EC 5003/EC 5003-03 units,

—the control of the single capstan tape drive in the EC 5612/EC 5012-03,

—the control of the reel motors in the EC 5012-03,

—the record and read channels for the PK/NRZ I system.

Technical data for individual models of large capacity magnetic tape units are given in Table 4.

Table 4. Technical data on Bulgarian magnetic tape units

Parameter	Large capacity devices						Small devices		
	EC 5012-01	EC 5012-03	EC 5612	EC 5003-03	EC 5003	ISOT 5003	CM 5300	CM 5302	ISOT 5006
Tape speed (m/sec)	2	3	3	5	3	0.32	0.32	0.63	1.12
Rewind speed (m/sec)	5	7	7	18	15	2.50	2.50	3.80	3.80
Recording format (number of tracks)	9	9	9	9	9	9	9	9	9
Recording method	NRZ I	NRZ I	PK/NRZ I	PK/NRZ I	PK/NRZ I	NRZ I	NRZ I	NRZ I	NRZ I
Recording density (bits/mm)	32/8	32	63/32	63/32	63/32	32	32	32	32
Width of transmission band ((kbyte/sec)	64/16	96	189/96	315/160	189/96	10	10	20	32
Width of magnetic tape, mm	ISO 12.7^{+00}_{-01}	ISO 12.7^{+00}_{-01}	ISO 12.7^{+00}_{-01}	ISO 12.7^{+00}_{-01}	ISO 12.7^{+00}_{-01}	ISO 12.7^{+00}_{-01}	ISO 12.7^{+00}_{-01}	ISO 12.7^{+00}_{-01}	ISO 12.7^{+00}_{-01}
Reel diameter	267 ISO	267 ISO	267 ISO	267 ISO	267 ISO	267 ISO	267 ISO	267 ISO	267 ISO
Interface	Voltage	Voltage	Voltage	Multiplex	Voltage	Voltage	Voltage	Voltage	Voltage

5.2. Small Magnetic Tape Storage Units

Bulgaria has developed two groups of magnetic tape units with different basic designs, i.e. with reel diameters of 216 and 267 mm. These groups differ in dimensions, hookup distances and tape transport design. The tape transport consists of a single capstan drive with start-stop operation. The compensators for variations in the parameters of the capstan drive motor and the reel motors in start and stop operation have a design with a mechanical lever: a one-level type for slow magnetic tape equipment and a two-level type for fast devices.

The magnetic tape is set up semiautomatically, using a device for the leader or endpiece of the tape. The tape transport motors can be controlled by analog servosystems which receive information on the current tape speed from a DC RPM generator located on the motor shaft of the capstan drive. The lever positions are determined by a photocell with a diaphragm. These two groups of small magnetic tape devices can be included in the configurations of SMEP computers by means of control modules. In addition, they can be used in other data acquisition and storage systems by means of auxiliary equipment.

The small magnetic tape units also have the NRZ I recording system. The magnetic tape parameters make it possible to compensate static shift only during recording.

Table 4 also contains technical data on these models.

6. A Matrix Processor Increases the Productivity of the EC 1035

The number of potential users of auxiliary data processing devices for rapid and efficient numerical processing of extensive data sets expressed as matrices and vectors is increasing steadily. Such computations are required, for example, in the following areas:

--seismic research (geophysics, location of raw materials in the earth's crust),

--image processing (radiology, processing of photographic images),

--space research (telemetry, orbital control),

--nuclear physics research,

--matrix arithmetic,

--solution of differential equations,

--digital signal processing.

Despite their increasing operating speed, modern general-purpose computers cannot meet the requirements for productivity and computational capacity. Multiply-iterated arithmetic operations with the components of large data sets are practically impossible for them. Accordingly, it is necessary to develop special computation equipment such as the EC 2335 matrix processor.

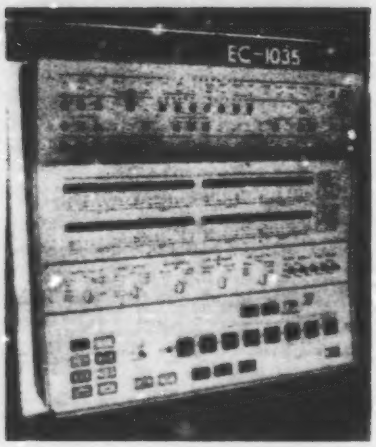

Fig. 17. The EC 2635 mainframe.

6.1. Connections

The EC 2335 matrix processor is connected to the EC 2635 mainframe by a special adapter which is built into the matrix processor and replaces one of the selector channels. The connection between the adapter and the matrix processor is made by a specific input/output interface.

6.2. System Control

From the point of view of the system, the matrix processor and adapter can be considered as an I/O device which combines in itself the functions of channel, control unit and peripheral device. This complex can be controlled by the same system of control words used in the Unified System's I/O systems and by the input/output interrupt mechanism.

6.3. Data Format

Data which are processed in the matrix processor can be expressed in one of three formats which are used in the JSEP:

--fixed point, direct code, short format,

--fixed point, auxiliary code, short format,

--floating point, short format.

6.4. Instruction System

The operation of the matrix processor can be divided into seven groups:

—vector transfer, in which the data are transferred from one field in working storage to another with change of format (from fixed point to floating point and vice versa),

—arithmetic operations on matrices:

  —scalar product,

  —vector product by components,

  —vector sum by components,

  —sum of vector components,

  —partial multiplication of matrix,

  —addition of squares of components,

  —square of matrix with sign,

—inspection of matrices (to determine minimum or maximum components and their positions,

—complex multiplication,

—solution of inequalities,

—signal processing operations (e.g. fast Fourier transformation),

—square interpolation.

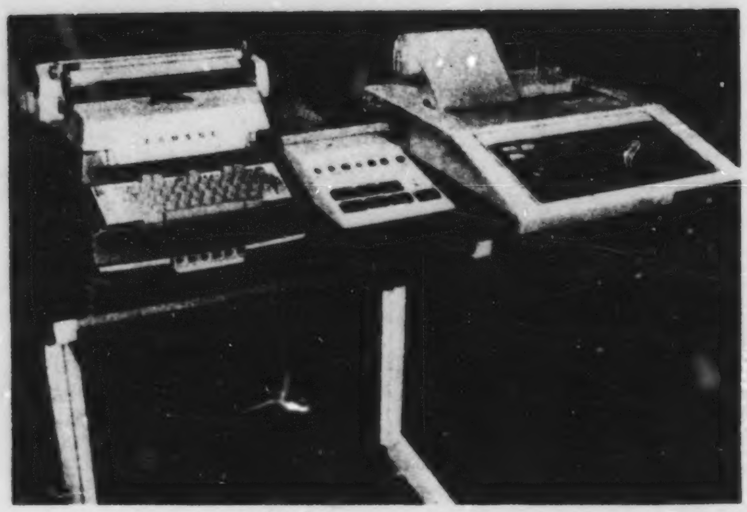

Fig. 18. Input/output equipment of the EC 1035 computer.

6.5. Scope of the System

The matrix processor includes the following groups (blocks):

—a subprocessor to hold and call the operand, which allows connection to the adapter and the EC 2635 mainframe, computation of the operand and control word addresses, and calling of operands,

—the arithmetic subprocessor, which carries out arithmetic operations on floating point numbers according to the pipeline principle,

—buffer memory, which stores operands, intermediate results and final results and serves as a buffer between the interface and the arithmetic subprocessor,

—control memory, which stores control microprograms for the operation of the two subprocessors,

—the microprogrammed control unit.

6.6. Basic Parameters

Duration of one machine cycle: 2 microseconds.

Operating speed: 5 million operations per second (multiplication and addition).

Capacity of interface between adapter and matrix processor: 3.5 Mbyte/sec.

Maximum size of operand: 64K components.

Basis of modular components: TT, 1, 2, 3.

Design: housing with two frames.

Power consumption: 1 kVA.

6.7. Software

The basic software of the EC 2335 matrix processor consists of input programs and a resident module. The module is written in Assembler language using the macro language and conditional assembly features.

Access is initiated by call routines in FORTRAN, Assembler or PL/1, using the SA instruction, which has a fixed format. The resident module performs the interrupt processing by means of a single code specific to the matrix processor.

The access method consists of six phases:

—the control phase,

—the syntactical analyzer,

—the channel program organizer,

—the queue controller,

—issuance of report,

—interrupt processing.

In addition to basic software, the matrix processor software also includes a program system for signal processing. This is a set of routines used to analyze various types of digital signals. The set includes routines which synthesize filters in accordance with specified characteristics and routines which help evaluate the filter effectiveness.

Since there is still insufficient experience and no generally-recognized method for evaluating the productivity of systems of matrix computers, it is difficult to give a general evaluation of the effectiveness of using a matrix processor. However, we have conducted a very large number of experiments in which we processed the same selected examples on an EC 1035 with and without a matrix processor (EC 2335).

The tests confirmed previous calculations to the effect that productivity was increased by 1 to 2 orders of magnitude. For an average measurement of a seismic path, for example, we used 2,000 quanta. The matrix processor was used for certain basic calculations such as deconvolution before and after summarization, filtering before and after summarization, and the use of a planar filter on 10 percent of the data.

The computer took 65.6 seconds to find the path difference using the central processor. This means that processing 300,000 24-channel recordings a year by matrix processor would take about 4,000 hours of machine time, while the system without the matrix processor would require 134,000 hours. Accordingly, for this example the productivity is increased about 34-fold.

7. The ESTEL-4 Data Processing System

The development of data processing in computer networks is a complex, long-term process. Accordingly, when developing the ESTEL 4 system, Bulgaria set itself the limited task of creating a modern teleprocessing system. The system could grow into a computer network or a distributed processing network without any essential changes in its components simply by using new software.

Another important consideration is the compatibility of the ESTEL 4 system with the ESTEL systems currently being produced. This makes it possible to use many applications programs written for the ESTEL 2 and the ESTEL 2.1 in the ESTEL 4 as well. The ESTEL 4 can be connected by means of a byte multiplex channel or a block multiplex or selector channel. In this case the EC 8371 processor operates with two computers simultaneously by means of two channel adapters. If two manually switched channel adapters are used with a single EC 8371 unit, it can be connected to four computers. However, it can operate with only two of them at one time. This capability of the EC 8371 is extremely important for organizing complexes of several machines.

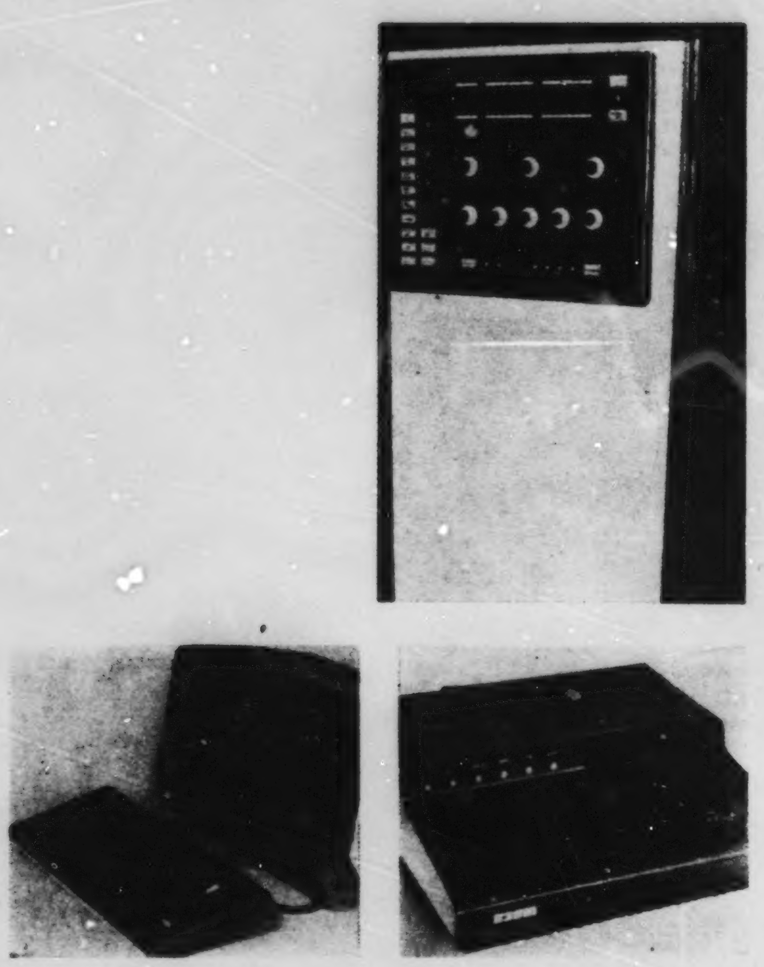

Fig. 19. Devices in the ESTEL 4 system: the EC 8371 processor, the ISOT 7925 terminal with display (lower left), and the ISOT 8500 small terminal (lower right).

7.1. The Processor

The EC 8371 makes it possible to receive up to 352 half-duplex connections at a nominal transmission speed of 12,000 bps. When the transmission speed of certain cables is increased, the number of cables is correspondingly decreased. The transmission speeds are in a wide range from 50 to 56,000 bps. Rates of 50, 75 and 100 bps are used for telegraph lines and rates of 100, 200, 300, 600, 1200, 2400, 4800, 9600, 48,000 and 56,000 bps are used for two-wire and four-wire telephone lines. The EC 8371 controls the dialing of telephone and telegraph lines from the computer.

The EC 8371 data processing processor operates with a 1-microsecond cycle, giving it a high capacity. The memory is monolithic and can be expanded modularly to 512 kbyte. The network control program operates in the processor; it controls the entire preparatory stage of long-distance transmission, i.e. line control, compiling and distributing reports, formatting and editing.

The network control program is associated with the actual teleprocessing and access method. It is stored in the processor.

The EC 8371 has two types of diagnostic tests. The first type operates under the control of the OS/ES 6.1 or DOS-3ES operating system and monitors the entire EC 8371 unit. The other type of test program consists of internal functional tests which monitor all blocks of the teleprocessing processor.

The teleprocessing processor may also be used as a remote concentrator. In this case, a special device, a remote program storage unit, is installed in place of a channel adapter. This device is equipped with a floppy disk unit which stores the control program transmitted from the computer. The terminals are connected to the teleprocessing processor functioning as a concentrator in the same way as to a local teleprocessing processor.

7.2. The EC 8531 Terminal

The ESTEL 4 system includes the EC 8531 intelligent terminal with working storage of up to 24 kbyte and up to three floppy disk storage units. The basis of the terminal is the EC 7187 printer and an alphanumeric keyboard. To the terminal are connected several types of input and output devices: a 480-character display (12 lines of 40 characters), the EC 7186 (DZM 180) serial printer with a speed of up to 180 characters per second, and the EC 6112 punched card reader for standard 80-column cards.

The programs to be executed by the EC 8531 terminal are transferred to the computer and catalogued, then forwarded as finished programs for execution in the terminal.

When the proper key is pressed, the corresponding program is called from the minidisk which controls terminal operation, provides operator support and the like.

From the device side, the terminal has a transmission rates of 200/300, 600/1200, 2400 and 4800 bps.

A multipoint connection is possible at the I2 or I1 level of the interface unit. It contains an amplifier for a range up to 500 meters. There is no need for a modem or a telegraph interface.

7.3. The ISOT 8531-01 Terminal

The ISOT 8531-01 terminal is a subset of the EC 8531 programmable terminal. It consists of an EC 7187 printer and an alphanumeric keyboard. Input/output buffers and a built-in test system using microprocessor components are provided. The terminal can operate either in the stop-start mode, to which the Bulgarian terminal is adapted, or in synchronous bitwise operation. It can be connected into multipoint configurations at levels I1 and I2. The ISOT 8531-01 has built-in modems for 200/300, 600/1200 and 2400 bps or a switching unit for four-wire telegraphic lines and a current amplifier for distances up to 500 meters and the like. The test feature is supported by test programs which operate under control of the OS/ES 6.1 and the DOS-3/ES operating components.

7.4. The ISOT 7926/28 Terminal

The ISOT 7926/28 terminal and display system consists of a terminal control unit, the ISOT 1926 unit, and a 7928 display. The ISOT 7926 is a display with a 40 cm diagonal monitor (green luminescence) with space for 1920 characters (24 lines of 80 characters) or 2560 characters (32 lines of 80 characters). There are two brightness levels which are software-controlled, as well as a software-controlled protective field. Editing and formatting can be done on the display. Microprograms resident in the microprocessor system make this operation possible. To control the terminal and display, there is control equipment for a connector cable to the computer using the BSC mode and a group for controlling the built-in modem with speeds of 600/1200, 2400 or 4800 bps, or the EC 8027 with speeds up to 9600 bps. In addition, the terminal unit can control up to seven additional ISOT 7928 displays with the same parameters as the ISOT 7926. If desired, this unit can also control the EC 7187 printer, which operates at a speed of 180 characters per second. The distance between the terminal control unit and the display and a separate display must not exceed 1,500 meters. The display terminal system is also monitored by diagnostics controlled by the OS/ES 6.1 and DOS-3/ES operating systems.

7.5. Terminal With EC 9003

The terminal based on the EC 9003 data storage system operates in the remote job entry mode. It consists of a small computer with the requisite peripherals which operates as a control unit for 16 monitor consoles used for data collection.

7.6. Addition of Other Terminals

All terminals of the older ESTEL 2.1 system can be connected to the ESTEL 4: the EC 8501 terminal, the ISOT 7925 terminal and display, the 56 100 terminal and display and the ISOT 8500 small terminal.

7.7. Modems

An interesting feature of the ESTEL 4 is the fact that it uses built-in modems, although external ones can be used as well.

The modems are built into the terminal next to the EC 8371 data processing processor. This is made possible by the decreased size of the modems and the telegraph interfaces (use of MSI and LSI circuitry throughout). For example, the 300 bps modem in the ESTEL 4 takes up only a single interchangeable module. Another characteristic is the extensive use of different loops, local and remote. In connection with the test programs, these loops considerably expand diagnostics of the communications lines, a feature which is extremely important in teleprocessing systems.

7.8. Software

The ESTEL 4 software is also suited for data processing in a computer network. Two operating modes are possible: emulated operation (with the DOS/ES 2.2 and the OS/ES 6.1 operating systems), and basic operation (with the OS/ES 6.1 and DOS-3/ES virtual operating systems).

The virtual method of teleprocessing and access to data in the computer operates with a network control program in the processor and enables all of the abovementioned terminals to have access to the computer. Here a modified protocol is used for all terminals. It is synchronous, bit-oriented protocol which simplifies and improves the effectiveness of the software and makes possible multipoint connection of various types of terminals on a single line. Thanks to the combination of the virtual teleprocessing and access method with the network control program, the load on the computer is decreased considerably, since this combination takes over management of the line and terminal.

An innovation in the ESTEL 4 is the fact that the information flow control system, which previously was considered to be a set of application programs, is now part of the teleprocessing and access method of the OS/ES 6.1 and expands teleprocessing capabilities. In this connection, the experience with the use of an information flow control system in the OS/ES 6.1 and the DOS/ES 2.2 in the ESTEL 2.1 is extremely valuable. Numerous programming packages for planning, financial calculation, text processing and the like can be connected to the combination of the OS/ES 6.1 with the teleprocessing and access method and the information flow control system.

8. Electronic Desktop and Pocket Calculators

The production of desktop and pocket electronic calculators was begun in Bulgaria in 1966 with the production of the ELKA 21, ELKA 22 and ELKA 25 calculators. These were based on discrete components. Then came the series 40 and 50 desktop calculators using LSI MOS circuitry and the series 100 pocket calculator. Bulgaria is one of the largest producers of electronic desktop and pocket calculators among the socialist countries.

Great progress in manufacturing technology and production of MOS integrated circuits and the development of multiposition display components provide the groundwork today for the production of all nonprogrammable electronic desktop and pocket calculators using a single circuit and display unit.

The calculation capabilities of the various groups of calculators will remain about the same in the future. Further development of these calculators will involve primarily more modern displays and printers. Currently, liquid crystals or displays based on them are proving particularly suitable, since they are simple and cheap and consume little power.

The development of new calculator models is oriented primarily toward new production technologies and inexpensive designs which meet modern requirements as regards color and shape.

8.1. Desktop Calculators With Displays

This group of desktop calculators includes the previously-produced ELKA 22, ELKA 42, ELKA 50 and ELKA 58 calculators. The ELKA 60 and ELKA 61 calculators are in the stage of development and introduction into production. They are based on MOS integrated circuits and multiposition luminescent displays.

The ELKA 60 calculator has a six-position display and one available memory location, carries out the four basic arithmetic operations, and computes percentages and square roots.

8.2. A Desktop Calculator With Printer

Currently the ELKA 55 calculator with a start-stop printer is being produced in Bulgaria in two modifications: one with power-on, overflow and memory-in-use indicators, and one with additional digital indication of the numbers entered and results.

The printer speed is 2.5 lines/second. It has 12 digit positions, a decimal point and two positions for the sign and the arithmetic operation symbol. The calculator performs the four basic arithmetic operations and calculates percentages. It has one usable memory location. The contents of the input register can be exchanged with those of the computation register; the calculator stores the results of multiplication and division in three memory locations available to it. It is designed using MOS integrated circuitry.

Fig. 20. The ELKA 55 desktop calculator with printer.

The ELKA 65 and ELKA 67, which have the same applications as the ELKA 55, are in the stage of development and introduction into production.

The difference is in their digital displays and shapes, which are modernized. The ELKA 55 calculator has a small digital display using LED's, and the ELKA 67 has a multiposition luminescent display with digits about 8 mm high.

8.3. Programmable Desktop Calculators

These are used to carry out various complex tasks in scientific research institutes, planning organizations, advanced schools and the like. The ELKA 56 is a calculator of this class. It operates in floating point with an eight-digit mantissa and a two-digit exponent. It has ten accessible memory locations and computes not only trigonometric and hyperbolic functions and their inverses, but also logarithmic and exponential functions.

It can be used for various conversions: from rectangular to polar coordinates and vice versa, from degrees to radians and vice versa, metric conversions and the like.

The calculator has the following program capabilities:

—72 locations in the program memory,

—programming and execution modes of operation,

—conditional and unconditional program jumps,

—program revision,

—automatic and stepwise program execution.

The ELKA 56 calculator uses LSI MOS circuitry and luminescent displays.

8.4. Pocket Calculators for Basic Calculations

The output of these calculators has increased considerably in recent years. The devices are used by elementary and middle school students, housewives, women employed in service organizations and the like. We produce several modifications of calculators in this group: the ELKA 101, ELKA 103, ELKA 107, ELKA 130 and ELKA 131. They are 8-digit types which perform the four basic arithmetic operations, calculate square roots and percentages and have one accessible memory location.

8.5. Pocket Calculators for Scientific Calculations

Advanced students, engineers and technicians in scientific research and design institutes use these calculators. The calculators of this type are the ELKA 135 and ELKA 137, which are based on MOS integrated circuitry and right-position LED or luminescent displays. They perform the four basic arithmetic operations, find roots, and calculate the trigonometric functions sin, cos and tan and their inverses, the exponential functions e^x and 10^x and the logarithmic functions ln x and log x. They have one available memory location. They operate in fixed and floating point, in the latter case with a five-digit mantissa and a two-digit exponent.

8.6. Programmable Pocket Calculators for Scientific Calculations

These calculators are less frequently used than the other types of pocket calculators. The ELKA 245, using LSI MOS circuitry and a luminescent display, is being put into production. It has 10 accessible registers and operates in floating point with an eight-digit mantissa and a two-digit exponent. It can be used to calculate trigonometric, hyperbolic, logarithmic and exponential functions. It performs various conversions: rectangular to polar coordinates, degrees to radians, metric conversions and the like. It has the following program capabilities:

—program memory for 72 steps,

—conditional and unconditional program jumps,

—program execution in two modes, automatic and stepwise.

The following authors participated in the preparation of this review of data processing products in Bulgaria: Dr. K. Boyanov, Kh. Karadzhov, S. Khristova, S. Aleksandrova, M. D. Bolen, B. M. Zonev, T. A. Topalov, S. B. Paskalev, B. K. Khristova, T. Popov, M. Kolarov, G. Momerin, G. P. Nikolay, V. D. Lazarov, G. P. Daskalov, Y. V. Ivanova, K. D. Kirov, S. I. Zheleznov and Y. Yulsari.

8480
CSO: 2402/68

COOPERATION IN COMPUTER APPLICATIONS TO RESEARCH HAILED

Budapest NEPSZABADSAG in Hungarian 24 Jul 81 p 6

[Article by Gabor Pal Peto: "One Topic, Three Cities, Six Research Facilities"]

[Text] The competition, within the framework of which university researchers receive extra grants for the purchase of materials, instruments, etc for research on topics they themselves suggest, was announced this year for the second time. Because of this, perhaps now is the best time to recount the results achieved in the first competition announced at the suggestion of, and financed by, the government's Committee for Scientific Policy.

Practically unique in its kind and in the information derived from it, was the research project related to the application of the so-called pattern [shape] recognition: this work was performed by a total of about 30 researchers in six research facilities in three cities.

Before we introduce the quite complicated concept of pattern recognition, it is worth while reviewing how this research project, multi-faceted in every sense, yet at the same time coordinated, came about.

What Patterns Must Be Recognized?

A seven-member research group headed by Dr Gabor Veress, has been operating for years at the Budapest Technical University [BME], in the General and Analytical Chemistry Department--in academician Erno Pungor's institute. Its assignment is the application of computer technology methods in chemical analysis. The mathematical and systems theory method called pattern recognition is also related to this task. From the nature of research follows, especially in a small country like Hungary, that people working in related fields know about each other, and often may even know each other. Thus when the opportunity presented itself--on the occasion the 1978 competition was announced--to receive extra grants for deeper research into their topics, they pooled their efforts and submitted a joint proposal: the above mentioned group, a few people from BME's Agricultural Chemical Technology Department, a couple of co-workers of MTA's [Hungarian Academy of Sciences] Technological Chemical Research Institute (Veszprem), the computer technology groups of Szeged University of Medical Sciences and of Semmelweis University of Medical Sciences in Budapest, and a few researchers of MEM's [Ministry of Agriculture and Food Industry] Food Control and Chemical Investigation Institute.

Six research facilities in three cities, one associated with the academy and one with a ministry, in addition to four university groups--one can imagine that coordinating the work was not the easiest. This became Dr Gabor Veress's job who says now that it was a very tiring but also very educational task. The way they started out is also very educational for others: when they received the assignment, all participants attended a 3-day conference in Veszprem where they thoroughly familiarized themselves with the theoretical foundations of their topic with the aid of outside experts, and evaluated the results achieved up to that time. This accelerated the development of these co-workers, and they also saw more clearly what had been done until then and how they should divide up the work.

But, what is shape recognition? The Hungarian name itself is difficult to understand because it is an inaccurate translation of the English original, which talks about pattern, referring to formation. It is true, however, that this does not take us much closer to understanding the thing, either. What is involved here is that various things--which may be objects, but may also be concepts--are to be listed into classes on the basis of data, for the most part measurable data, but these are not very simple so that classification is not possible on the basis of measuring one single characteristic.

I heard a very good comparison from Dr Veress. Let us imagine that we have to separate horses and donkeys on the basis of measured data. This appears to be a simple task because the donkey is gray, small, and his ears flop. However, there are also gray horses, larger donkeys, and also smaller horses with floppy ears! Thus we can get into quite a big confusion even with this simple task.

But, to get serious now: pattern [shape] recognition is usually related to processing measurement data, and the classifications must be created on the basis of this. One such series of data can be, for example, the curve of EKG examinations, on the basis of which the persons studied must be classified as ill or healthy. The qualification of foods is a similar task: for bread, for example, the basis of this is its hardness, water content, etc. In the case of drinks the qualification is done on the basis of evaluating the chromatograph curve: its peaks indicate the quality and quantity of the individual components. And actually the problem of pattern [shape] recognition is related to this in chemical analysis also: the future of high performance chemical analysis is in automation, which does not work without rapid processing of the data ("classification" of the materials studied!), and this leads one to computerized processing.

It becomes obvious from all this--even though we have extremely oversimplified the matter--that basically we are dealing with computerized evaluation of measured data, which also requires extremely complicated mathematical work. The researchers of six research facilities in three cities banded together to accomplish this, and also at the same time to immediately work out practical applications.

Help for the Doctor

It would not even be possible to list the results of more than 2 years of joint effort. Since--no matter how surprisingly this may sound--the mathematical foundations of medical diagnosis, chemical analysis and food qualification methods are the same as far as the application of pattern recognition is concerned, they were able to eliminate a whole series of parallel and thus unnecessary work, they were able to share the computer programs, the theoretical knowledge and even the practical application experience with each other, regardless of how much the specific form of their work projects differed.

Yet--in outlines--the main results of the separately and jointly performed work can be summarized as follows:

A comprehensive theoretical treatise was born.

So were 17 computer programs, or rather, program systems, besides this.

A whole series of medical applications has become possible with the aid of these. One of these is the reparation of recovery prognosis of heart attack victims. Another one: investigation of the dangers in the position of a fetus, advanced indication of whether irregularities should be expected at birth. (This can be "predicted" on the basis of delivery pains and of the characteristics of the sound of heart beats.) Another possibility: In the case the newborn has jaundice it must be decided whether blood replacement is to be undertaken or not, and this is an operation not without dangers. This decision can be made on the basis of six parameters, and according to experience gained thus far, the number of newborns who need, or who do not need their blood replaced, can be classified with 80-90 percent accuracy, that is, this is the ratio of agreement between decisions made on the basis of the computerized pattern recognition method, and the doctor's decisions. And, to still remain with medical applications: 93 percent correct decisions were made on the basis of the computerized model in diagnosing inflammation of the pancreas, based on 14 characteristics.

Chemical analysis has also derived great benefits from pattern recognition research: the results served as foundations for methods by which the data obtained from mass-spectrometric and infrared spectrometric measurements can be classified faster, automatically and with savings in human labor, that is, the composition of the materials measured is easier to determine.

Bread, Coffee, Cognac

A method which is easily applicable to qualifying food was also developed. Some foods are qualified on the basis of judgement by the senses, or by preference to put it simply, when the jury's members evaluate the goods they taste, by awarding it points. However, one cannot be certain whether these really express the objective quality of the food item in question. Therefore, based on this research, the data obtainable with measuring instruments, and the results of evaluations obtained by examining them with the senses were evaluated for a whole series of foods, and it was concluded that for some foods the point system must be modified to really correctly evaluate these products. This is how the results of pattern recognition research were used to qualify spice paprika, tea, coffee, Parisian sausage [large diameter, meaty Wieners], butter, bread, plain cake, potato bread, crescent-shaped rolls, bread rolls, milk, and some alcoholic beverages. And the results even provided the method for recognizing imitations.

These appear to be divergent and differing tasks--and yet, the common characteristics of their solutions were discovered through joint work. Thus the medical science, chemistry and also food qualification--and by generalization of the results, science as a whole has also gained much from it. Nothing else was needed for it than support for the dormant ambitions of the university research groups. For this reason we are justified in having expectations from the research project competition now being announced again.

8584
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COMPUTER AIDED MACHINING OF PRINTED CIRCUIT BOARDS

Budapest FINOMMECHANIKA MIKROTECHNIKA in Hungarian Vol 20, No 6, Jun 81 pp 176-179

HALLER, H., commercial director, Excellon Europa GmbH, West Germany

[Abstract] In his lecture delivered at the "Printed Circuit Board Seminar 1980," held 21-23 May 1980 in Lahnstein, the author discussed three DNC (the abbreviation now standing for Distributed Numerical Control, while earlier it stood for Direct Numerical Control) system of increasing capability levels for machining printed circuit boards. The DNC-1 system consists of an RS 232 computer, an interface, and an Excellon machine; it provides no feedback. The DNC-2 system uses an OPIC-III programming unit and floppy disk for data storage, and can control up to eight drilling and/or milling machines. The DNC-III system comprises a central processor unit, a hard-disk background memory, and a programmer, capable of operating up to 20 machining units in real time, and offering feedback capability. The main advantages of DNC systems are: economical central storage of the program sections, security of the stored data, absence of data carriers at the manufacturing site, reliable electronic data transmission to the fabricating machines, saving of time, and easier maintenance. An economic study indicated that major savings could be realized by their introduction. Figures 4, table 1, no references.

2542
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MANUAL AND AUTOMATIC CONTROL OF PHOTOMASKS AND SOLID STATE WAFERS. PART I

Budapest FINOMMECHANIKA MIKROTECHNIKA in Hungarian Vol 20, No 6, Jun 81 pp 183-191

HONTY, Laszlo, staff scientist, MTA [Hungarian Academy of Sciences] KFKI [Central Physics Research Institute] MSZKI [expansion unknown]

[Abstract] In this first part of a series of articles the author discusses the following subjects: overview of photomasks (types, applications, design, construction, manufacture, and quality control), overview of the major faults encountered in photomasks (pinholes, intrusions, extrusions, geometric distortions, gaps, dimensional accuracy, and so forth), classification of photomask quality control equipment types, some major features of microscopes used in the control systems (stage movement, object size, absence of vibration, magnification, field of view, illumination, photography, measurement of dimensions, ergonomic aspects), the optical requirements for the microscopes with special emphasis on their ability to show edges, and a classification scheme for microscopes and other optical devices for dimension checking (including comparison-microscopes for the identification of random faults). The procedures used in the quality control of photomasks affect the quality of the check as much as do the engineering parameters of the instruments employed. Figures 9, tables 2, references 3: 1 Hungarian and 2 Western.

2542
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NEW UHF DIPLEXER

Budapest HIRADASTECHNIKA in Hungarian Vol 32, No 5, 1981 pp 194-196

SZABO, Pal, Dr, graduate electrical engineer, department head, and FURST, Lajos, graduate electrical engineer, group leader, BHG [Beloiannisz Communications-Engineering Factory] Development Institute

[Abstract] Based on 10 years of operating experience with the UHF-FM system in Hungary designed to insure satisfactory reception of the Kossuth, Petofi, and 3rd-program transmitters, a new UHF diplexer type was developed, of which the primary advantage is that it is easier and more economical to build. The modifications involve the use of hard soldering of the contacts of the filters and of screw joints at their connections; the use of a new mantle made of silver-plated copper in the 3 dB hybrid component, the use of aluminum-alloy feedlines; the use of a specially designed KONTASET cabinet; and the use of a summating automatic system for better separation of the transmitters. The new system offers engineering parameters that are at least as good as those of the first-generation system, and its reliability is expected to be better. The critical area in the first-generation system was the short-circuiting of the filters; thus development of the second-generation system stressed modifications in this area. For this reason, the adjustments of the L and C parameters were made less prone to malfunctioning, and increased attention was given to the cooling design. Figures 3, no references.

2542
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DESIGNING OF HIGH TEMPERATURE OPERATIONAL AMPLIFIERS

Budapest MERES ES AUTOMATIKA in Hungarian Vol 29, No 5, 1981 pp 169-176
manuscript received 9 December 1980

VAMOS, Attila, SZKFI [expansion unknown]

[Abstract] The designing of operational amplifiers assembled from discrete components for use at high temperatures (up to approximately 280°C) in applications such as probes for geophysical depth measurements is discussed. Theoretical and practical studies were carried out to establish the upper temperature limit of circuits with bipolar silicon transistors, silicon diodes, and Zener diodes; the temperature-dependence of solid-state parameters; and the adjustment of the working point and stability of transistorized amplifiers. The basic circuits of operational amplifiers (emitter followers, voltage amplifiers, and current generators) were reviewed on the basis of the results of these studies, and circuit designs for operational amplifiers and measuring amplifiers were tried. Finally, the temperature characteristics of amplifier circuits found promising on the basis of the trials were evaluated in laboratory and field experiments. The best circuits had an upper operating-temperature limit of almost 300°C and highly satisfactory resistance to aging. These circuits could be installed in sturdy and durable casings for operational use. Figures 10, no references.

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SCIENTIFIC AFFAIRS

No. 712

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SOVIET SCIENTIST KAPITSA DWELLS ON SIGNIFICANCE OF 'METEOR-PRIRODA' SATELLITE

Sofia RABOTNICHESKO DELO in Bulgarian 13 Jul 81 pp 1,7

[Article by Moscow correspondent Dimitur Gornenski: "Prestigious Place in the 'Space Club'"]

[Text] Andrey Kapitsa, USSR Academy of Sciences corresponding member, on the significance of the new joint Soviet-Bulgarian experiment.

Moscow, 12 July

Once again we feel the dizzying altitude of the heights reached by contemporary Bulgaria in the course of its socialist development. The latest "Meteor-Priroda" artificial satellite is using even more advanced apparatus for the observation and study of the atmosphere and the surface of the earth, prepared by Soviet and Bulgarian scientific centers. This success of our scientists working in space research confirms even further Bulgaria's prestigious position among countries who have reasons to consider themselves permanent and active members of the "space club."

The new artificial satellite is part of the "Meteor" system which is a structural component of the 1967 Soviet space program and which, subsequently, became one of the areas of joint work with the fraternal socialist countries within the framework of the Interkosmos program. This system is also of great importance in terms of the progress achieved in a number of basic sciences. Nevertheless, its most distinguishing feature is the most tremendous role it plays in the solution of applied problems, above all in serving agriculture and other material production sectors. The artificial satellites in orbit, launched with Soviet rockets, are today the indirect and direct assistants of meteorologists, geodesysts, geologists, foresters and many other specialists who are feeling ever more tangibly the help which comes from outer space, and agronomists and agrobiologists and environmental protection specialists.

The launching of the new satellite is a proper occasion for presenting the view of one of the noted Soviet scientists in the area of space research. In the course of our talk Andrey Kapitsa, corresponding member of the USSR Academy of Sciences, emphasized that, by broadening the study of the universe, outer space science is increasingly meeting practical human requirements. Today, he stressed, literally all economic sectors are using most extensively data coming from outer space. Discussing in particular the system which includes the "Meteor-Nature" artificial satellites, he emphasized the following:

"Other space equipment used for the observation of the earth's surface is, essentially, a flying laboratory equipped with photographic and television systems, lasers and radar. With their help we determine the intensity of the earth's and the reflected radiation from the earth's surface in the visible and the infrared zones of the spectrum and within the radio range. Combined, these means make it possible to observe everything which can be distinguished by the eyes of man and a large percentage of that which is invisible to the human eye. Thus, for example, photographs received in the infrared range clearly indicate centers of destruction of various crops caused by pests. Normal crops are clearly distinguished from those threatened with drought.

In the case of clouds no observation is possible in the visible and infrared areas of the spectrum. In the radio range, however, the earth's surface can be studied from outer space regardless of weather conditions or time of day. Radio waves enable us to obtain exhaustive data on soil humidity. All this is only a small part of the useful services performed by the Meteor-Nature satellites. Let us add to this a variety of other information. The data reaching earth from such satellites make it possible to look at the condition of the ice cover and the snow lines, to assess the water resources and to determine precisely the area of ground heated by the sun. The image clearly shows centers of fires in mountain areas. This facilitates the efforts to put them out by the forest services.

By using observations in the various parts of the spectrum, compared with other methods used by plant protection stations, we can obtain data on diseases affecting crops and plants ten to 12 days earlier and take effective measures. The economic benefits of such a faster plant protection is tremendous, bearing in mind that due to diseases and pests 25 to 30 percent of the harvest perishes.

Many other examples could be added. The use of space methods in agriculture offers tremendous possibilities. The economic result of the utilization of space information in the next few years over Soviet territory alone may total billions of rubles.

The opinion of this great scientist is quite indicative of the success in this specific area of space research described in the announcement on the launching of the latest satellite in the Meteor-Nature series. What makes this even more pleasurable is that it represents the latest significant step in the development and intensification of cooperation and joint work between our scientists and their Soviet colleagues--the representatives of the country which inaugurated the space era of mankind and is, to this day, a first-rate power in the development and study of outer space for peaceful purposes, a country which is also assisting the development of space research in many other countries, the fraternal socialist countries first of all.

5003
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ADDITIONAL INFORMATION ON REQUIREMENT USED IN 'METEOR-PRIRODA' SATELLITE

Sofia RABOTNICHESKO DELO in Bulgarian 15 Jul 81 p 4

[Article by Corresponding Member Prof Dr Kiril Serafimov, science observor for RABOTNICHESKO DELO: "New Space Accomplishment, Result of Soviet-Bulgarian Cooperation"]

> [Text] The new satellite "Meteor-Priroda" was launched in the USSR on 10 July. Its purpose will be to resolve a number of scientific, methodical, technical and applied problems related to the telemetric sounding of the earth. Aboard the satellite, along with a scanning television camera, experimental three-channel microwave radio meter and service systems (for guidance, stabilization, data, transmission and reception of commands, energy storage and others) developed in the Soviet Union, a multi-channel spectrometer, single-channel microwave radio meter and computer system for the recording and preliminary processing of data, designed, developed and manufactured in Bulgaria, have been installed.

This joint fraternal space flight marks the beginning of the final stage of the "Bulgaria-1300" long-term comprehensive target space project. Initiated in 1976, as an interesting idea of a handful of enthusiastic people, this project met with the energetic support of the Interkosmos Council and, particularly, its unforgettable first chairman, Academician B. N. Petrov. It was based on a number of original ideas and rational plans for their implementation, major topical and important scientific objectives, and opportunities for the solution of progressive technical problems and for their multiplied utilization in practical work.

As always, the party and the government wisely assessed the excellent opportunities offered to our science and technology in taking a major step forward in inaccessible yet important and leading directions of contemporary knowledge and technical progress. The "Bulgaria-1300" space project was approved in 1977. Accordingly, this year two satellites will be launched into orbit. The first will be in accordance with the Soviet "meteor-nature" national program; the second (which will be launched in the near future) will be based on the Interkosmos program and will carry the name of the great 1300th anniversary of the founding of our state-- "Bulgaria-1300."

The first project is already a fact. Every day it has one or two transmissions broadcasting data as it passes over our country's territory. The Soviet receiving centers are obtaining from it a real flood of space information. As was announced, the purpose of the satellite is to resolve scientific and technical problems and obtain applied data as a result of the telemetric sounding of our planet. However amazing it might seem, over the past 15 years we have determined that a number of geomorphological data and geological and hydrological characteristics may be determined more accurately from outer space and that new ground resources may be found more effectively. At the same time, space methods in the areas of geophysics, geodesy, cartography, geography, oceanography, ecology, plant cultivation and other important areas were developed. This new joint satellite serves precisely the development of the earth sciences and the solution of a number of national economic problems.

Our systems and apparatus installed aboard this modern outer space system enjoy a number of advantages compared with all other apparatus used so far for this purpose. Let us emphasize, first of all, the exceptionally original new principle applied in the 32-channel SMP-32 spectrometer, which uses a light-sensitive photolinear element developed on the basis of semiconducters. This represents a new and even more advanced application of the original principle used in that world-famous Bulgarian Spektur-15 manual spectrophotometer which has been doing successful work aboard the Salyut-6 orbital station for almost two years.

The efficient technical implementation of this principle, the modern elements used and the original circuit solutions make the SMP-32 unquestionably the best multiple-channel spectrometer so far used in outer space (let us point out for comparison's sake that four- and six-channel equipment has been used aboard other satellites for purposes of telemetric sounding). The relatively low resolution capacity of our spectrometer is successfully compensated by the great advantages offered by the numerous optical and infrared channels which make it possible to use qualitatively new methods in the applied interpretation of data. Thus, our equipment is very suitable for global planetary studies and for the solution of big national economic problems covering vast territories of continents and oceans.

The single-channel microwave radiometer is a first step taken by our electronic industry in the creation of space radioengineering super-high-frequency equipment in the centimeter range. Its record-setting sensitivity will make it possible to determine the radioemission circumstances and the related heat fields and water reserves over considerable areas on earth. Its successful functioning is encouraging us to undertake new technical efforts in the field of super-high frequencies which are already finding ever more extensive applications.

Now, as we are preparing to engage in the intellectualization of the production process, the original ship electronic computer system for the recording and preliminary processing of data obtained with the help of Soviet and Bulgarian scientific and study instruments enjoys a deserved interest. The system makes possible the dynamic and adaptable control of instruments and systems. It ties standard telemetry to the exceptional requirements of the transmission of a tremendous amount of information.

Let us particularly emphasize that this is the first time comprehensive control-testing equipment with a microprocessor system and programmed control was developed, to guide the testing process and allow a certain diagnosing of eventual sources of deviation from normal operations. Since this comes closer to the problem of the reliability of our space development, let us emphasize that exceptional measures were taken in the case of the meteor-nature satellite to ensure the automatic switching of reserve assemblies and systems and to guarantee their proper and lasting work.

I am aware of all the difficulties experienced by the collective of the Central Space Research Laboratory, which created these advanced space systems and instruments. The endless and restless efforts, exceptional enthusiasm, skill, daring and inventiveness of the group yielded pleasing results. Together with the immediate developers of such technical equipment, involved in this great exploit are hundreds of Bulgarian engineers, technicians and workers, mainly of the Ministry of Machine Building and Electronics. Good organization which involves many new and original elements of dynamic management made the timely and qualitative completion of this responsible part of the "Bulgaria-1300" project possible.

Now many new problems face the managements of the Bulgarian Academy of Sciences, Ministry of Metallurgy and Mineral Resources, the National Agroindustrial Union, the Committee for the Protection of the Environment, the Main Geodesy and Cartography Administration and many other Bulgarian departmental institutes, in terms of the optimal utilization, both at home and abroad, of the flow of space data received. It is also time to surmount the considerable difficulties which exist in the receiving and primary processing of information from space and in preparation for its comprehensive and purposeful interpretation. Our science and technology will use ever more extensively the outer space facilities as an incentive for modern development, and the new major success achieved in space will unquestionably encourage all of our creative workers in the struggle for the scientific and technical, economic and all-round progress of the homeland!

5003
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ADDITIONAL COMMENTS ON 'METEOR-PRIRODA' SATELLITE

Sofia VECHERNI NOVINI in Bulgarian 18 Jul 81 p 6

[Statements by scientists from the Central Laboratory for Space Research (TsLKI) of the BAN [Bulgarian Academy of Sciences]: "The Bulgaria 1300-II in Flight"]

> [Text] The latest joint development by Bulgarian and Soviet scientists in the area of the study and utilization of outer space for peaceful purposes is under way. "Meteor-Priroda" satellite is in flight. Along with instruments developed in the Soviet Union, a complex set of Bulgarian apparatus are registering data in outer space. The nature of the new representatives of our domestic space instrument manufacturing is described by scientific associates from the Central Laboratory for Space Research (TsLKI) of the BAN.

Professor Dimitur Mishev:

Telemetric studies of the earth from outer space are one of the most tempestuously developing directions in space research, in which Bulgarian scientists and specialists have been traditionally engaged and have achieved definite successes and earned recognition both at home and abroad.

After the development of instrument systems for comprehensive quasisynchronous measurements, after the essential and scientifically and practically important program for research and experimentation, prepared for the flight of G. Ivanov, the first Bulgarian cosmonaut, and after the unique multiple-channel"Spektur 15 M" spectrometric system and "Spektur 15 MS", its airborne variant, we are now witnessing a new display of Bulgarian science and technology in outer space. Bulgarian and Soviet scientists are engaged in joint development in the field of research and utilization of outer space for peaceful purposes. The "Bulgaria 1300-II" set of scientific equipment, developed on the basis of the "Bulgaria 1300" plan, is in flight. We can firmly state that it is the first time that such a complex and significant set of instruments for the study of own and reflected radiation from various natural formations and the atmosphere, in the visible immediate infrared and super-high-frequency range of the electromagnetic spectrum is flying in outer space. The entire set is controlled by a computer microprocessor system mounted aboard the satellite with active functional reserve and preliminary data processing aboard the satellite.

Also mounted on the satellite is a 32-channel spectrometric system for the study of reflected and own radiation in the visible and close-infrared range. The radiation of natural formations themselves is recorded in four different super-high-frequency wavelengths. The single-channel radiometric system was developed by Bulgarian scientists, while the tri-channel system was developed by Soviet scientists.

Huge data flows are reaching the receiving centers in Bulgaria and the USSR.

Important scientific and applied problems will be resolved following the interpretation of the multiple-spectrum data and images, such as the mapping of geospectrometric charts of the territories under study, the analysis of spectral images of different natural formations and phenomena and their dynamics, the drafting of catalogs of optical characteristics (spectral, optical and radiational) of various objects, in accordance with their seasonal variations, the determination of the full amount of water contained in the atmosphere and many others.

Scientific Associate Anton Stoimenov:

The modern instrument sets used for the telemetric study of the earth gather and transmit to ground stations huge amounts of data. A single communication involving the set of Bulgarian scientific equipment installed aboard the "Meteor-Priroda" satellite alone provides several million data bits. The great potential which our country has acquired over almost two decades of intensive development of computer technology is at the root of our success. The output of the IZOT DSO [State Economic Trust] and, above all, the OZZU [Consolidated Memory Systems Plants] in Plovdiv and the Elektronika Plant in Sofia, and the cadres trained at the Institute for Computer Technology, together with the specialists from the Central Laboratory for Space Research, made the designing and organization of a modern Center for the Reception, Recording and Primary Processing of Data from the "Bulgaria 1300-II" project possible within an exceptionally short time.

At the present time one stage of the scientific line of "Telemetric Methods" of the TsLKI of the BAN is fully operative. About 15 minutes after the latest communication with our computer aboard the "Meteor-Priroda" ISZ [Artificial Earth Satellite] the Primary Processing Center begins to receive data recorded on a machine-compatible tape. In a few minutes the computer releases the first printout showing an assessment of the conditions governing the reception and breakdown of eventual disturbances within the channel connecting the ground with the satellite. This marks the beginning of the process of automatic data synchronizing and decoding. Urgent information is provided on the condition and work system of the entire set of apparatus on the satellite. Metaphorically speaking, we begin by feeling the "pulsebeat" of the satellite equipment. This is followed by a quick assessment of the essential information provided by each of the scientific instruments--the 32-channel spectrometer and the radiometers. The initial coded information on the condition of the instruments is exchanged with the Soviet colleagues.

In its dialog with the operator on duty the primary processing system expands the entire volume of data, projects and provides the geographic coordinates of the studied target on earth and of the position of the sun for each ten km of track. Before the beginning of the subsequent communication the recorded data have been prepared for the study and interpretation by all consumers--scientists dealing with earth sciences, the atmosphere and the protection of the environment, with the help of computers.

Scientific associate Doyno Petkov:

The current generation of satellite systems for the study of space around the earth is a complex set of scientific instruments. Systems control and primary processing of data obtained from the satellite is accomplished with the help of computers mounted aboard the satellite.

The task in designing the set of "Bulgaria 1300-II" scientific instruments, mounted aboard the "Meteor-Priroda" satellite, was to develop a computer set mounted inside the satellite which would control and plan scientific experiments automatically. Such a computer complex was created on the basis of the Bulgarian SM 600 microprocessor family. The main position in the structure of the computer complex is held by the microcomputer aboard the satellite. It provides the communication and the synchronization of the comprehensive scientific equipment with the satellite systems. It processes the commands issued from the ground and establishes the necessary operational systems of the complex. The information flow received from the scientific systems is processed, expanded and sent along radio channels for communication with ground data processing centers. In addition to such basic tasks related to the processing of commands and controlling the information flow, other problems are resolved as well, such as the recording of data on digital tape recorders at each point of the orbit and their transmission at a convenient reception time on the ground; verification of scientific instruments; self-checking of assemblies and blocks within the system, and many others.

Greater reliability is a characteristic of the computer system aboard the satellite. All main units, such as the microcomputer, the operative memory, the digital tape recorder, the power sources, and others, for example, have backup systems so that should any one of the units break down the system can continue to operate.

Today, as the set of "Bulgaria 1300-II" scientific apparatus aboard the "Meteor-Priroda" satellite is flying in space and transmitting data using telemetric earth research methods, we can proudly say that the first Bulgarian airborne computer is operating in outer space normally.

Scientific Associate Boyko Tsenov:

The "Bulgaria 1300-II" set of scientific apparatus can operate in several basic regimens: direct data transmission, information storage and information retrieval. In a direct transmission mode data may be received on the ground only within the zone of radio visibility of reception centers in Bulgaria and the USSR. This is the most frequently used regimen, for the reception center in Bulgaria covers the country's entire territory and the data supplied by the satellites will be used mainly by Bulgarian scientists who are studying Bulgarian resources for a variety of economic purposes. The work program of the satellite was developed by specialists from the TsLKI at the BAN on the request of the information interpreters and users.

For the time being everything is working perfectly and the use of backup units has not been necessary.

Spas Delistoyanov:

The entire information received with the help of the instruments mounted within the set of "Bulgarian 1300-II" scientific equipment, located aboard the satellite, is transmitted along a digital radiotelemetric channel operating at frequency 137 megaHz. Our reception center is essential to the experiment. This called for the establishment of an exceptionally reliable system for reception and reporting. The TsLKI of the BAN developed a number of specialized electronic systems for receiving, synchronizing, recording and controlling data. Soviet specialists, who took part in the tests conducted by our reception center, immediately preceding the launching of the satellite into orbit, gave high marks to the quality of the entire reception complex.

In practical terms, how are the data received? The moment the satellite enters the radiovisibility zone of our reception center, the signals broadcast from the satellite are received by the ground directional tracing antenna. The data are received in a specialized system which synchronizes and restores the digital flow.

The restored digital flow is recorded on the SM 5300 Bulgarian-made digital tape recorder with a specialized recording control system. The same recording is duplicated by an analog tape recorder which records the signal at the output of the receiver. Every day we receive from two to four communications depending on the program given the scientific complex. In each communication a flow of several million bits is recorded. This tremendous amount of valuable data is recorded on tape by the primary processing unit of the computer.

The "Bulgaria 1300-II" scientific complex has already made about 100 revolutions around the earth. Today we expect its daily appearance over our country with confidence. However, I shall never forget the tense three minutes the evening of 10 June, when everyone in the reception center knew that the satellite had "risen" on the southeast, watching it "blindly" with the help of the antenna and waiting for its programmed communication. At precisely 2,053 hours the equipment aboard the satellite was turned on and in the course of a few seconds, as we followed the work of the control equipment, our two years of intensive work and sleepless nights had been crowned with success.

5003
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DEVELOPMENT, USE OF INDUSTRIAL ROBOTS DISCUSSED

Robots Currently in Production

East Berlin DIE WIRTSCHAFT in German Vol 36 No 6, Jun 81 p 21

[Unattributed article: "Industrial Robot Technology of Today"]

[Text] The 10th Party Congress has significantly raised the original targets for producing and using industrial robot technology. Its decisions start from the idea that this path should lead to a decisive contribution towards making the national economy more efficient, especially towards releasing personnel. The directive of the Party Congress, therefore, formulates the task: "For an all-round change of the engineering and technological level of production as a whole, the development, production, and application of industrial robots should be significantly speeded up, for the step-by-step automation of production processes, for releasing personnel, and for reducing monotonous and physically hard work that may be hazardous to health. During the period from 1981 to 1985, 40,000 - 45,000 industrial robots should be produced and deployed.

Because of their character and because of international experience, it is necessary to develop comprehensively the in-house construction of robots and handling units in the combines and enterprises. Central production capacities for industrial robots must be created in important branches of industry. For this purpose, electrical engineering and machine construction must create the necessary preconditions for furnishing the required deliveries, such as microelectronic controls, electrical and hydraulic drive elements, and mechanisms, at the required level." (Directive of the 10th Party Congress of the SED, Dietz Publishers, Berlin 1981, p. 41).

As an important exhibition concerning the intensification of the national economy recently made clear, industrial robot technology may not be regarded too narrowly. This term is currently understood to mean the totality of basic means which are used for the automatic handling of work pieces, tools, and materials, to automate main and auxiliary processes. Their main objective is to release personnel. Industrial robots have available one or more axes of motion. With respect to their positioning and working sequence, they are either permanently programmed or are freely programmable. A distinction is made between two major groups: process-flexible and process-specific industrial robot technology (compare table). Process-flexible industrial robot technology comprises point-, track-, or sensor-controlled units, which are flexible in use, up to universal applicability. These units have a freely programmable motional sequence along one or more axes and for track motions.

Process-specific industrial robot technology comprises units and devices for making more efficient and automating equipment and processes of all types. This category includes machine- and equipment-bound units and also process-bound technology. The latter includes units for making more efficient and for automating the most various branch-specific engineering tasks in the economic units. This can also involve stand-alone handling technology, such as is especially produced in in-house construction for improving the efficiency of the combines and enterprises.

A community of users organized by the Umformtechnik Combine provides an example of the deployment of process- and machine-bound industrial robot technology. For existing individual presses, various devices were built, based on the division of labor, in the course of improving efficiency. These devices include, among others, belt-advance devices, strip feeds, roll-on and roll-off devices and coilers, as well as unbatching devices. Six hundred presses are supposed to be equipped with this organized in-house construction. It was expected that 800 to 1000 employees will be released.

A step towards a more complicated industrial robot technology is the type series of flexibly useable, freely programmable industrial robots for loading tool machines. Three sizes are projected, with various useful masses and various designs. The handling masses for type IR1 are 5 to 10 kg, for type IR2 10 to 40 kg, and for type IR3 40 to 100 kg. These industrial robots are produced in stationary and mobile form. To this are added special designs for integrating the industrial robot into the machines or into machine systems. Preparation for actual use involves a complexity that should in no case be underestimated and that significantly affects the economic result. The research center of tool machine construction (9001 Karl-Marx Stadt, Karl-Marx Allee 4) can provide detailed information on how to approach this. Experience with such deployment was also published in the "Wirtschaft", No. 4/1981, pp. 5-10.

The industrial robot IR3 P is already being used as a mass-produced unit, as the joint product of the Zwickau Engineering College and the VEB Sachsenring Automobilwerke at Zwickau. The IR3 P is used to load tool machines and systems. The automobile plants in Zwickau are currently using a total of 14 different robots and 71 insertion units within the framework of complex solutions for improving efficiency. They are considered pace-setters in the deployment of robots. They confirm this judgement, with their goal of deploying at least another 250 robots and insertion units during the coming five years.

One result of the collaborative work between Robotron and Ilmenau Technical College is the freely-programmable industrial robot PHM 4. It is used to automate assembly and testing processes, especially in the production of writing and office equipment, as well as to fabricate electromechanical and electronic components and modules. Information concerning this type of robot can be obtained from the VEB Robotron Center for Research and Technology (8012 Dresden, Leningrad Str. 15).

The ZIS 995 module for welding robots was developed by the Central Institute for Welding Engineering of the GDR. It makes in-house production of welding robots and welding production lines possible for the enterprises. Economical solutions can be achieved in this fashion, which are amortized in two to three years. The control is a numerical point-line control, which can be completed with position sensors for finding the seam. It can be used in all welding operations for arc welding and resistance welding. The Central Institute for Welding Engineering offers documents for the module for follow-up use, and provides counseling services (4300 Halle/Salle, Köthen Str. 33a).

The ZIM 60 is a robot which is produced in the Central Engineering Enterprise of Metallurgy. It is a joint venture of all the combines in the area of mining, metallurgy, and potash. It involves an electrically driven hinge robot, which is freely programmable along five axes. Its handling mass is 60 kg. It has already been employed as a loading robot for technical and transportation tasks.

A manipulator module for the modular construction of stationary and portable manipulators has been developed by the Vogtland Tool Machine Factory. These devices are used to load the tools of special machinery and conveyor lines of large-scale and mass production. The maximum work piece weight is 60 kp, the number of movable axes is five max. The manipulators are controlled through the freely programmable microelectronic PS 2000 control. The units are driven hydraulically. Information can be obtained from the VEB Tool Machine Factory Vogtland (99 Plauen, Schenkendorfer Str. 14).

The industrial robot IR 5-10 is used in several contexts by the Household Devices Combine, for handling processes with the freely programmable PS 2000 control (modular system in stationary construction, three electrically driven main axes and three hydraulically driven gripper axes, work piece weight up to 5 kg). Information is available from the VEB Engineering Enterprise for Efficiency (9010 Karl-Marx Stadt, Srassburg Strasse 3).

Purposeful and Economical

By 1985, 40,000 to 45,000 industrial robots will be produced and deployed in our economy. For many branches, this represents unusually high demand. Researchers, designers, engineers, and technical specialists will have to throw onto the scales all their knowledge and commitment and all their capabilities. The performance of those combines which do not belong among the central robot producers will also become a conspicuous standard. Everywhere, the search for suitable and economically effective solutions predominates more and more. International trends, as well as our own experience, indicate that it is not only technically demanding, universally useable industrial robots that are of importance, but, for a considerable number of applications, simple devices of handling technology will suffice. These are equipped with the necessary technical capabilities for their respective tasks, such as control technology, movable axes, sensors, etc. For the more complicated types of robot technology, it is also true that only those technical parameters should become practical reality that are actually needed for deployment purposes. Only in this way, can the desired results be achieved with comparatively low economic expenditure.

Indeed, this was one of the core ideas of the technical congress of the KDT (Chamber of Technology) and of the VEB Research, Development and Efficiency of Heavy Machinery and Installations in Magdeburg, concerning the development, production, and application of industrial robots. Industrialists and scientists made it clear that in no way should only technically "complete" industrial robots be our only objective.

Sometimes there are quite simple solutions even for complicated problems. The decisive point is to find precisely that solution which accomplishes the respective handling task in a technical and economic sense. The technological tasks here are unambiguously the central emphasis in the Central Institute for Welding Technology of the GDR. This determines the configuration of "tailor-made" welding robots from the module set. Precisely because of this tailor-made character, these robots can be produced and deployed economically. The analyses of Dresden Technical University show that many assembly tasks can be solved quite well with only two freely programmable axes, and thus simple controls can certainly be used. There also are examples where combines are working with simple sensors in applications where other combines are waiting for the sensor technology of the future.

With the 1982 draft plan, the combines are proposing conceptions for the use of microelectronics in which the strategies for robot technology occupy an important position. The universal industrial robots with at least five degrees of freedom and the simple robots deserve special attention. In every case, economy is the decisive factor. For this reason, handling devices and simple robots for improving the technology itself must be developed with priority in the near future and must be produced as in-house means for improving efficiency.

Recognition of the Environment

In research laboratories, robots are already accomplishing greater feats than their "colleagues" in industry. They climb stairs, run through labyrinths, react to spoken commands, or answer questions.

In many institutes in the world, technical people are working on imparting new capabilities to the robots: To recognize their environment and their own condition, to sense the presence, position, and quality of work pieces or tools, to measure lengths, traversed paths and forces, to estimate obstacles, and to evaluate tolerances. For robots to be able to sense such quantities, many highly sensitive sensors (measurement sensors) must be developed. Contacting (tactile) sensor systems are used for specifically directed, sensitive gripping. Here, the inside of the gripper hand is equipped with sensors which report what forces are involved in the gripping process and what is the position and shape of the gripped object. Non-contacting sensors react to physical effects, such as changes in electrical resistance, of inductances, and of capacitance. They also use sound waves or radiations. Optical sensor systems occupy a special position. Especially for industrial robots, such sensors are being investigated in many highly developed industrial nations.

At the Central Institute for Cybernetics and Information Processing of the Academy of Sciences of the GDR, there also has been built an experimental stand for image recognition for industrial robots. The recognition method and the device technology have been successfully tested for selected work pieces of machine construction and fine mechanics. The efforts of the near future in this area will be directed towards achieving a more reliable solution with less expense for industrial utilization. The objective is to transfer to robots the industrial assembly of certain work pieces.

The industrial robots of the next years will also be equipped with the capability of reacting "intelligently" to unforeseen situations. For this purpose, the robots will be able to store and to learn from experience. The techniques for recognition, for setting up optimum handling plans, and for making decisions will impart to these robots a certain measure of "intelligence".

Industrial Robot Technology

Process-Flexible Industrial Robot Technology		Process-Specific Industrial Robot Technology	
Industrial robot for loading - loading of tool machines and analogous technical applications - transport processes - stacking and unstacking	Technological industrial robots - assembly - coloration - welding - forging - guidance of tools and working objects - textile processes	Machine-bound handling technology (fixed component of technical equipment) - insertion work - withdrawal work - magazining - positioning - automatic troubleshooting	Process-bound industrial robot technology (automatic handling technology for performing loading and technological processes) - loading - technological tasks

Center for Technological Development

East Berlin DIE WIRTSCHAFT in German Vol 36 No 4, Apr 81 pp 9-10

[Article by Heinz Zerressen, director for technology and rationalization, VEB 7 October Machine Tool Combine, East Berlin, and secretary, EPAG (Industrial Robot Development, Producer, and User Association): "Model Solutions for Important Individual Cases"]

[Text] The technological center for making more efficient the tool machine combine "7 October" has increasingly been developed into a center of efficiency policy. In close collaboration with the combine enterprises, it should analyze scientifically processes which prepare for production as well as the production process itself, in order to obtain new information concerning the effective collaboration of people, working means, and working objects, and thus to provide effective support to the enterprises.

The combine "7 October" is responsible for the production and deployment of industrial robots. In accord with this great responsibility, the technological center concentrates on preparing robot technology for technological deployment. Another point of emphasis is process and methods research with the objective of finding complex, highly effective solutions for improving efficiency according to the principle of "integrated production segments (IGFA)" and "integrated assembly (IMO)". Connected with this are technological research tasks for improving the efficiency of technological preparation for production by the use of EDP (electronic data processing) as well as by the step-by-step construction of technological and design jobs.

The long term efficiency conception of our combine, for the period 1980 through 1990, consequently specifies the following concrete tasks:

1. Automation of the loading of the tool machines and analogous applications by using loading robots.

2. Unburdening and releasing personnel from difficult areas, and from areas that may be hazardous to health (sand blasting, trimming of castings, paint spraying, etc.), by using technological robots.

3. Complex improvements in the efficiency of transport and conveyance processes within the framework of integrated production by using robots of all categories and designs.

By our exertions in the area of technical research and preparation for the deployment of industrial robots, we were capable of making available the following materials to the enterprises of the "development, production and application community for industrial robots":

- Basic technical documents for the technical working plan and for the set-up of technological units;
- type projects for technical units with industrial robots;
- technological specifications for the equipment of technological units and production cells;
- plans for the design and implementation of working processes for the production of peripheral equipment of technological units with industrial robots;
- design documents for the peripheral equipment of technological units of industrial robots;
- uniform guidelines on "protection-quality requirements in the deployment of industrial robots" as a foundation for all initial applications;
- uniform execution plans for the preparation, implementation, start-up of technological units with industrial robots;
- basic documents of a technological deployment strategy for industrial robots (loading robots).

Figure caption: The lathe operator Rainer Wunderlich, from the tool machine combine "7 October" here programs the working steps of an industrial robot for the next two shifts. This robot simultaneously loads two NC machines. Besides programming and checking this technological unit, the highly trained lathe operator can also operate three processing machines.

First type project
DF 2 CNC 600 (Type WZM)
IR 2/S II - IRS 2000 (Type IR)
Two or three work piece memories for welding pieces.

Second type project
DS 2 CNC 600 (Type WZM)
IR 2/S II - IRS 2000 (Type IR)

Two or three work piece memories for chuck pieces

Third type project
DS 2 CNC 600 (Type WZM)
IR 2/S II - IRS 2000 (Type IR)
Corrugation processing with two work piece memories

Fourth type project
DS 2 CNC 600 (Type WZM)
IR 2/S II - IRS 600 (Type IR)
Welding piece processing with integration of the measurement location

Fifth type project
DF 2 CNC 600 (Type WZM)
IR 2/S II - IRS 600 (Type IR)
Work piece processing and integration of the measurement location.

Work is being done on making these working documents more complete. On their basis, it is possible to prepare for use more effectively and to secure overall coordination of activities. By working out typical solutions, the objective of the national economy to obtain short-term and multivalent implementation of technological units with industrial robots is being met. In this way, it is possible to work out the technological, constructive, and technical performances only once, and to apply them with a little adaptation effort in the enterprises for the specific application. For the Berlin enterprises and combines of the development, production, and user community, as well as for the enterprises of our combine and other potential users, typical projects for the loading of lathes for the processing of chuck and center lathes in single and multimachine operation and various peripheral equipment have been or are being worked out within the framework of our research program in close collaboration with the coordination group of the EPAG (Development, Producers and User Association) and other institutions.

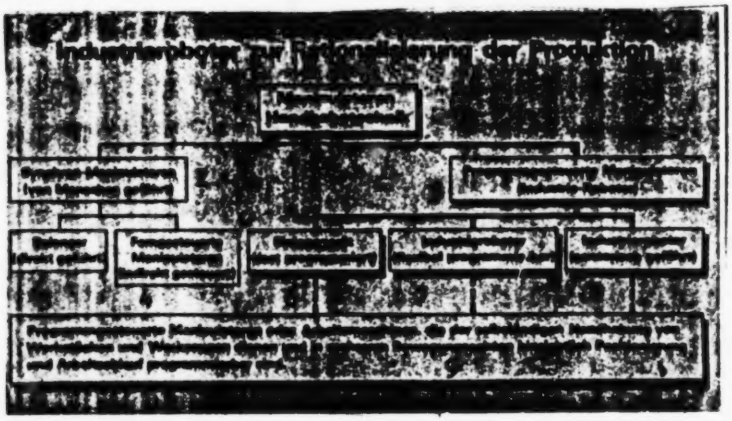
The typical projects are based on information that was obtained during the preparation and planning of technological units in the VEB Berlin Tool Machine Factory, Marzahn, in the VEB Lathe Plant, Leipzig, and in the VEB Combine "Fritz Heckert", Karl-Marx Stadt. Experience from specifically directed international collaboration with our fraternal socialist countries has also been taken into account. In agreement with the long term conception for product development and the conception for the further development of industrial robots, technical research will be concentrated more strongly towards enhancing the effects from the utilization of robot technology. In particular, the release of personnel is to be promoted in the design of typical projects by, among other factors, the following measures:

- Use of automated measurement site in the technological unit with industrial robots;
- implementation of a detection of work piece breakage with optical and/or acoustical indications;
- implementation of a machine-integrated measurement system to secure the finished processing of tool components;
- implementation of wear and compensation measurements and realignment of tools in combination with measurement controls;
- development of a diagnostic system in robot-equipped technological units for

applications in a third shift with only a few operators, on the basis of complex automated solutions.

These demanding objectives require a reinforcement and shaping of the technological potential and the build-up of a powerful experimental center in the central enterprise of our combine. Here, initial solutions and further developments in automation should be pursued from a technological perspective and should be tested in long term tests.

The most important tasks of the experimental center will consist in developing multivalent solutions for the highly productive use of industrial robots, starting from the international status in the area of robot engineering, and in close collaboration with socialist countries - for example, with the Peoples' Republic of Bulgaria, there already exist quite specific agreements.



Industrial Robots for Improving Production Efficiency

1 Manipulators, handling technology
2 synchronous manipulators (human guidance)
3 balancer (directly guided)
4 remotely controlled manipulators (indirectly controlled)
5 program-controlled manipulators (industrial robots)
6 insertion unit (fixed programming)
7 industrial robot (flexible programming)
8 industrial robots (guided by sensors)
9 Progam controlled manipulators or working machines, which are used for the independent handling of work pieces and tools and which can be programmed along several axes of motion as regards positioning and working sequence.

Robot Manufacturing Center

East Berlin DIE WIRTSCHAFT in German Vol 36 No 4, Apr 81 p 9

[Article by Fred Dellheim, plant director, VEB Berlin-Marzahn Machine Tool Factory: "Central Manufacture of Robots"]

[Text] As a consequence of the decisions of the Politburo of the SED Central Committee and of the Ministerial Council, upon directive of the Minister for Tools and Processing Machines, important tasks for the development and production of robot technology were entrusted, in mid-1979, to the Berlin Tool Machine Factory. These tasks comprise not only the undertaking of production on the basis of model-construction documentation by the Research Center of Tool Machine Construction, but we were also charged with the responsibility to develop industrial robots as well as to create production capacities for their production. The scope of the production of tool machines was not reduced thereby. The production of the first 20 industrial robots in the year 1980 proved to be an extraordinarily complicated task, which could not have been solved without close collaboration with several cooperation partners and with the central operation of the combine "Fritz Heckert". The latter, in parallel to ourselves, likewise produced 20 robots.

This task was all the more complicated since production was new not only for the final producers but also for all the cooperation partners. The available documentation could not fully correspond to the conditions of mass production. Both because of a lack of production capacities and also because of the necessarily short run-through times, many processes were necessary which involved a division of labor.

Besides the principal partners, such as the enterprises of the combines ORSTA-Hydraulics and the VEB Numerics "Karl Marx", the enterprises "John Scheer", Meuselwitz, and Mikromat Dresden from the "Fritz Heckert" combine and other cooperation partners participated in the project.

Building up a working organization in such a short time and the many problems that had to be mastered required two preconditions:

First of all, a deep understanding had to be developed for the significance to the national economy of the task entrusted to us, and an attitude for mastering these tasks in conformity to the party had to be created. Under the leadership of the party organization, quite extensive political-ideological work was performed in this connection. From the operating section of the Chamber of Technology, this task was effectively supported by lectures and other qualification measures.

Secondly, tight management of these processes was required in order to guarantee that all the directorates could manage their responsibilities in a coordinated fashion. The weekly conference of all responsible parties in the "robot" working staff of the enterprise director, under the leadership of the project manager, proved a necessary and effective measure.

It is understandable that such a complicated process could not run without friction and without contradictions within the enterprise and between the cooperation partners. But due to an open attitude conformable to the Party, the production tasks were solved successfully. With the delivery of the robots to the user enterprises and due to the close collaboration with the development, production, and user association in Berlin, the scientific and production association in Karl-Marx Stadt, an the enterprises in Magdeburg, Leipzig, and Dresden, all the preconditions were created for the initial applications and for the gathering of valuable experience in the deployment of robot technology.

Collaboration with the research center of tool machine construction in Karl-Marx Stadt during this period comprised not only scientific-technical questions for securing production during the year 1980. The research center accepted major responsibility for supporting, by means of programming typical applications, the preparations for deployment within the enterprises. But the main point was to draw conclusions from the production experience of the year 1980, to increase the effectiveness of robot deployment and to be able to produce, beginning in 1981, robots that can be flexibly deployed and freely programmed, in accord with the Politburo decision.

These tasks also demand significant development performances in the combine ORSTA-Hydraulics and in the VEB Numerics "Karl Marx". They also require thorough revision of the design documentation in our enterprise. It here proved good and necessary, in defending the individual developmental steps, if the other combines and enterprises participating in the cooperation chain, are present to each participating partner.

Up to now, we have succeeded quite well in coalescing various perspectives and requirements into optimal solutions. Of course, this required much consultation on the level of the enterprise directors and general directors. Consultations under the management of the Minister were also required. Now we are convinced that the lofty objectives of the 1981 plan will be mastered, although, with us for example, this implies tripling production at a significantly higher technical level.

Our task comprises the development of a construction series of loading robots of various sizes and shapes. Due to the high qualifications of many cadres and due to the intensive study of international experience and developmental trends, we have good preconditions for our own point of view and for a scientific difference of opinion concerning solutions that are effective and that are compatible with the international status. At a recent closed meeting, in which the partner enterprises and research institutions participated, a common point of view was worked out. After being confirmed by the Minister, this formed the foundation for further work.

This point of view, for example, anticipates corrections in the developmental sequence, corresponding to the partial assortment that will be handled in the first instance. It takes into account the trend towards increasing deployment of electrical drive technology, and it also includes aspects of closer coordination of the development work in the area of loading robots with the development work of other industrial areas for technological robots. Due to the collaboration of the Academy of Sciences, problems of the development of second and third generation robots could be clarified.

An essential part of the responsibility of our enterprise consists in building up production capacities for robots while simultaneously increasing the production of tool machines. By efficiency measures we are using the available operating terrain to create the required production area for future years.

The capacities which will be newly built should not only be effective in securing the piece numbers anticipated by 1985 but, on the basis of more effective technologies, they should also make possible further increases. To secure investments that coincide with the development and transfer of robots, one needs high deployment readiness not only in our enterprise but in all the collectives that participate in planning and implementation, especially the principal contractor construction of the BMK (Building and Assembly Combine) Magdeburg. Optimum collaboration will be secured through biweekly reports to the investing agency.

The logical implementation of the task entrusted to us, of developing and producing loading robots, demands further steady efficiency increases of tool machine production and steady further development in agreement with the needs of the Republic with obligations towards socialist countries - especially the Soviet Union - and with requirements of exports into the NSW (non-Socialist monetary area). Our enterprise collective is fully addressing these tasks under the leadership of the party organization.

Production-User Association Organized

East Berlin DIE WIRTSCHAFT in German Vol 36 No 4, Apr 81 pp 5-6.

[Article by Wilhelm Frischmuth, general director, VEB 7 October Machine Tool Combine, East Berlin: "Cooperative Work Assures a Fast Pace"]

> [Text] The heads of the following combines, enterprises, and scientific establishments cooperate in the EPAG [Industrial Robot Development, Producer, and User Association]:
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> 7 October Machine Tool Combine, Berlin; Berlin-Marzahn Machine Tool Factory; Automation Facilities Construction Combine, Berlin; Rail Vehicle Construction Combine, Berlin; Karl Liebknecht Transformer Works; Berlin Metalworking and Semifinished Products Works; Berlin Automated Refrigeration Enterprise; Bergmann-Borsig; Central Engineering Enterprise for Metallurgy; Humboldt University of Berlin; GDR Academy of Sciences; Bruno Leuschner College for Economics; Wildau Engineering School; Lichtenberg Engineering School; Karl-Marx Stadt Machine Tool Construction Research Center; Berlin Bezirk Planning Commission.

For the 80's, an increase of output and a growth of effectiveness and quality are necessary. These results will be decisively determined by the success of accelerating science and technology and thereby guaranteeing a comprehensive advance of efficiency in the national economy. One important Party line is to achieve higher economic results from scientific progress by the broad application of robot technology.

The tool machine combine "7 October" Berlin was set the task of pursuing the development, transfer, and production of industrial robots in such a way that it becomes a co-determining factor in the international scientific-technical level in this area. Our combine was thus entrusted with a heavy responsibility in terms of the national economy. Fulfilling this responsibility, primarily requires the use, from the very beginning, of the advantages of our Socialist social order for achievement according to plan and directed towards proper objectives. Starting from the social significance of robot technology, as an essential component of technical innovations necessary to intensify production, and building on the basis of the decisions concerning "measures for the development, production, and deployment of industrial robots", which were promulgated in May 1979 by the Secretariat of the Central Committee of the SED by the Ministerial Council, we formed the EPAG in February 1980. Through this "Development, Production, and User Association for Industrial Robots", we wish to open up the great potencies of Socialist community work. Such a complex and complicated task required both clear political leadership and uniform and coordinated action beyond area boundaries, including the creative collaboration of scientists. Under the leadership of the General Director of the tool machine combine "7 October" Berlin, - and with the preservation of full individual responsibility of each partner for the solution of the tasks posed to him - the industrial enterprises of the capital, the supplier combines, representatives from the research center of tool machine construction, and scientific institutions in Berlin are consequently acting together. It is their task to manage the development, production, and deployment of industrial robots for the metal-processing industry of the capital. Already in its formation, the EPAG could lean on the progressive assistance of the District Management of the SED Berlin. In May 1980, the Secretariat provided a clear and specific orientation for the political leadership and for the management implementation of all those measures which have as their objective the accelerated development, production, and application of industrial robots.

In the battle programs of the Party organizations of all Berlin enterprises participating in the project, as well as in the letter of the tool machine constructors of the capital to the General Secretary of the Central Committee of the SED, Comrade Erich Honecker, of 2 June 1980, the requirements and obligations were made manifest, of mastering, in socialist competition, the necessary accelerated tempo in preparing and implementing production. Today, we can judge that the purposeful creative work of the employees, the high flexibility of management, and a constructive approach by all the partners have succeeded in successfully accomplishing the tasks posed by the Sixth Congress of the District Management of the SED Berlin, for the political, economic, ideological, and organizational preparation for the Tenth Party Congress in the area of the production and deployment of industrial robots. Furthermore, the objective set by the decision of the 14th Conference of District Delegates, namely to put into operation eight deployment centers of industrial robots within the capitol by the 10th Party Congress of the SED, will also implemented. The will be built in the central enterprise of the tool machine combine "7 October", in the VEB Bergmann-Borsig, in the VEB Berlin Brake Works, in the VEB Berlin Metallurgical and Semi-finished Goods Works, in the VEB Automatic Refrigeration, in the VEB Transformer Plant "Karl Liebnecht", and in the VEB Central Engineering Enterprise for Metallurgy. The Party project "Deployment of Industrial Robots" in the VEB BWF (Berlin Tool Machine Factory) Marzahn has already been implemented and is now being used as an experimental stand for testing the modules.

The coordination and cooperation of the work of the combines, enterprises, and scientific institutions by the EPAG has proven itself as a form of political and organizational leadership of such a technical innovation process which must be quickly implemented and which has a decisive character. A high performance contribution of the departments for increasing the efficiency of user enterprises as well as initial results from the deployment of industrial robots have been achieved in a very short time.

To prepare the building of deployment centers also included familiarizing the employees of the participating enterprises with the significance of this technology in the battle for higher output rises and to arouse their readiness for active collaboration.

The concepts of the party and enterprise management proved themselves here. These were directed towards an effective solution for the political-ideological and technical-organizational tasks. Thus, starting from the Party administration and carried forward by the comrades of the individual working areas, an atmosphere for mobilizing additional activities could be created everywhere. Stimulated by results which were constantly made visible, true Socialist efficiency collectives developed. Looking back on the one year's activity of the EPAG, it can be said that the high performance reached in 1980 and in the first quarter of 1981 was possible only because an attitude conformable to the party was always combined, in these implementation collectives, with the advantages of Socialist collaboration and mutual aid. Where responsible tasks were entrusted to youth, the Party principle of promoting and challenging youth was once again confirmed.

Because of the constant political-ideological work to form uncompromising attitudes, it became possible, with various suppliers, to overcome a lack of readiness to accept risk. Still another positive result of the collaboration within the EPAG should be mentioned here: the close Socialist collaborative work with scientific institutions. For example, the "Bruno Leichner" College for Economy developed the appropriate methodological foundations for the economy of robot utilization. A collective of 23 students is now verifying, in the deployment centers, the practical maturity of the existing methodological materials.

In the leadership organization of the community, a series of measures proved especially effective, for example the formation of a permanent coordination group consisting of representatives from the user enterprises, under the leadership of the Secretary of the EPAG. It could render effective assistance and support especially to those collectives for which the loading robots from the Marzahn Tool Machine Factory are intended, but which hitherto have had little or no experience with numerically controlled tool machines. For example, this concerns the VEB Berlin Metallurgical and Semi-finished Goods Plants as well as the Central Engineering

Enterprise for Metallurgy.

The periodic consultations of the enterprise directors of the participating enterprises, under the leadership of the General Director of the tool machine combine "7 October", as well as a regular exchange of information among the technical directors of the user enterprises have also proven themselves. These meetings made a significant contribution towards increasing the personal commitment of the managers, towards clarifying problems involving the division of labor, towards deciding basic questions, as well as towards solving particular technical problems. For example, by an efficient division of labor between the enterprises in the capital, it was possible to produce the required peripheral equipment for the industrial robots and to make them mutually available. This effective mode of procedure also is the basis for an increase of technical knowledge in all the enterprises and for the simultaneous formation of contacts between government and managers. In the future, too, these factors will contribute towards joint solutions of complicated problems.

Thus far, the implementation of the 1981 planning tasks in the area of industrial robots is again characterized by many initiatives from the employees of all participating enterprises. Starting from the decisions of the 14th Conference of District Delegates, these initiatives are directed towards the further worthy preparation of the Tenth Party Congress of the SED.

The 1981 industrial robots from the tool machine combine "7 October" Berlin especially must have significantly enhanced use characteristics. Characteristic features in this connection will be a new hydraulic drive technology as well as a multi-axis electronic control technology. These ambitious objectives generate the necessity of securing parallel development, testing, and mass production. The combine ORSTA-Hydraulics and the VEB Numerics "Karl Marx" likewise bear major responsibility for this.

In order to guarantee such synchronous operation, all forces of the Marzahn Tool Machine Factory were concentrated towards assuring, in conjunction with the Research Center of Tool Machine Construction, that the first 20 industrial robots were started up and at the same time their design was revised.

On the basis of the decisions of the 14th Conference of District Delegates, the further activity of the EPAG basically concentrates on still further applications of robot technology in the industry of the capital. Their effective use should significantly increase productivity, should lead to a savings in working forces, should eliminate monotonous and physically difficult activities as well as activities hazardous to health, and should improve the working conditions of the employees. This presupposes that, in every combine and in every enterprise, existing technologies as well as the production organization will be thoroughly analyzed and - building on this - rapid designs will be developed for the deployment of robots by the year 1985. The objective is to produce a savings of two to three employees for each industrial robot.

To provide effective support, even in this year, for the quicker and much broader utilization of robot technology in the enterprises of the capitol, the EPAG is collaborating in the completion of the district program on the basis of the conceptions of the combines and enterprises.

The tool machine combine "7 October" must develop complex solutions for automating small scale and medium scale assembly line production. In order to be able to implement this goal rapidly - in parallel to actual robot development - the technological efficiency center of the combine began to create type solutions for production cells.* Practical type solutions of technological units for corrugated and flanged work pieces already exist at the present time. In order to test out pilot solutions, we are setting up an experimental center for production cells in the central enterprise of the combine. In 1982, with its first expansion stage, it will create the preconditions for rapid transfer of these complex technological solutions.

Its development to an industrial robot technical center presupposes close collaboration with the Academy of Sciences of the GDR. This will secure an accelerated development of sensor-controlled (equipped with visual and tactile capabilities) industrial robots. Already in the first half of 1981, we want to establish the contractual relationships, so that not only testing and assembly line production of robots can be developed, but also complete production cells related to practice.

The development and design work will be implemented on time, and cooperation will take an effective shape in the introduction of more types of industrial robots by the combine "7 October". These factors will be decisive ones in deciding the time and the effectiveness for deploying robots in the capital. At the same time, we must continue to develop the tool machines that are intended for combination with industrial robots in such a fashion that the adaptation effort for the user drops significantly.

In order to achieve successfully and effectively the aim defined by the General Secretary of the Centrol Committee of the SED, Comrade Erich Honecker, in his concluding remarks at the 14th Conference of District Delegates, namely to deploy 1200 industrial robots as well as process-specific handling technology in the capitol by 1985, the Socialist community work must be carried forward at a still higher level on the basis of deployment conceptions and on the basis of the combines' and enterprises' own activities.

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*Production cells are spatially organizationally closed technological units, which consist of one or more automated tool machines, by means of which one or more component families can be processed completely or nearly completely in an arbitrary sequence of the production process, and which have a partly automated flow of work pieces to work piece depots before, in between, and afterwards, which is implemented by means of an industrial robot.

Experience in Robot Application

East Berlin DIE WIRTSCHAFT in German Vol 36 No 4, Apr 81 pp 6-9

[Article by the directors of various East Berlin enterprises (see source subheading below): "More Rapid Exchange of Experience Through Application Centers in Berlin Enterprises"]

[Excerpts] Dr. Heinz Brusch, Plant Director, VEB Bergmann-Borsig:

During the 1980's, our enterprise collective must also take new routes to utilize scientific-technical progress still faster and more comprehensively. Related to this idea also is the decision to create an application example in our enterprise for the use of industrial robots, in honor of the 10th Party Congress. Taking into account the available robot technology, we decided to organize the initial application in the small-mechanical production of the enterprise. A technological unit for the lathe work on shaft parts was designed, and this was equipped with an industrial robot of the type IR 2/S II.

In comparison with other enterprises of the EPAG, our plant has some special features. These are based on the handling and processing of turned shaft parts. The production cell that has been conceived as a type project is designed for processing chuck lathe parts. Starting from our production assortment, we are to decide for a different variant, which required some changes of the peripheral device technology.

In engine construction, numerous studs, dowel screws, and other bolt-like parts are needed both for the new construction of gas and steam turbines and also, to a considerable extent, for repair needs. These components previously have been predominantly produced on conventional lathes in small-mechanical production. However, in the case of our production, a decided piece-work fabrication was involved, and consequently the piece numbers and lot sizes of most components lie at the lower limit for effective fabrication modes and principles.

The production cell had to be adapted to these contingencies in order to achieve optimal efficiency. For this reason, the production cell includes, among other things, a center lathe type DS 2 CNC 600, an industrial robot type IR 2/S II - IR 2000 with a long-section gripper, two work piece storage units for shafts and two rotary column cranes for loading the work piece storage units.

The production cell was combined with an existing lathe DFS 400 NC to form a two-machine operating complex. A special feature relative to the chuck variant is the long-section gripper for shaft-shaped parts and the work piece storage unit for shafts with an hexagonal upper storage section.

By using the generally automated system, we achieve a saving of two jobs and consequently a relative release of four employees. Despite considerable investment costs, the increase of industrial goods production yields a recovery time of about three years.

At this time, a study is being worked out to determine the application possibilities for further robots. We are here concentrating on making several technical processes more efficient, for example, welding technology or sand blasting.

Figure caption: The VEB Bergmann-Borsig is the first one to perform lathe work on shaft parts. An IR 2/S II with long-section grippers loads a center lathe machine type DS 2 CNC 600. The shafts are prepared in two storage units (here in the model).

Manfred Friedrich, Plant Director, Karl Liebknecht VEB Transformer Plant:

We are using the industrial robot IR 2/S II, which the Marzahn Tool Machine Factory has integrated into a technological unit consisting of four NC machines. The industrial robot here functions as a loading robot for the NC machine DF 2 CNC with three work piece storage units. The entire machine complex is supposed to be operated by one employee per shift. We are therefore making a transition form a three-machine operating system to a four-machine operating system.

Many weeks and months of strenuous work have been mastered in the meantime, and there were numerous problems that had to be cleared along the way. The present status could only be achieved by the joint work between the enterprises of the EPAG and by the collective collaboration within the Youth Project. With high spirit, youth secured the practical implementation of the task, for example, the conversion of the machine to the four-machine complex ahead of schedule. Special emphasis was here placed on the qualifications of the employees. The operating organization of the KDT was particularly useful in this connection. The qualitative changes resulting from the handling technology imply higher information requirements for many colleagues. Operators, repair personnel, efficiency experts, technologists, and managers had to be trained in questions of the control, operation, programming, maintenance, and service, without thereby neglecting current operating tasks.

The technical documentation of this new technology was not always complete or was not available in all particulars. For this reason, improvisation was often necessary. The good collaboration within the EPAG and the actions of the coordination group made a valuable contribution here.

For our experience, however, it is necessary also to make some remarks concerning the peripheral equipment of the technological unit. Within the framework of the EPAG, our plant was assigned the task of undertaking the construction of the storage units for all the initial user enterprises. Unfortunately, the construction drawings that were provided us from the research center for tool machines could not be used for our application. This made it necessary for our efficiency department to develop a new solution for the storage units in a short time. The collective charged with this task did this in such exemplary fashion that the solution has in the meantime already been accepted as a patent. Within only two months, we could deliver the first storage units. The good collaboration and the division of work in building these peripheral units, between the VEB Refrigeration Berlin, the VEB Berlin Brake Plant, and our own plant deserves special mention here. An engineer of the Youth Object was here specially entrusted, for this task, with the leadership and coordination of the work required therefore. By the end of March 1981, 17 storage units could be made available to the initial users. This example of a rapid solution of efficiency tasks indicates clearly, in our opinion, what power, what wealth of ideas, and what commitment can be aroused among the employees if the task is unambiguously defined and the objective is clear.

With the above-mentioned first application example in the TRO (Berlin-Oberschoeneweide Transformer Works), we have gathered experience for further application possibilities. This experience is already applied in the designs up to 1985. Thus, the next application, the "layering of core sheets" for transformers, is being prepared technically and technologically for 1982/1983.

But our enterprise must also increase the rate of utilization of industrial robots and handling technology, corresponding to the requirements of the eighties. The experiences of recent months are an important foundation for this.

Figure caption: The work piece storage unit in the peripheral equipment of the loading robot IR 2. A young collective in the efficiency department of TRO quickly developed this storage solution, was awarded a patent for it, and secured the timely start-up of the Berlin application centers.

Egon Pfeil, Plant Director, VEB Berlin Brake Plant:

In our enterprise, too, the introduction of new technology was never free of problems. But much experience exists in this area and the insight that the political-ideological work that has been done will be decisive factor for the success of deploying new technology. It was precisely a few negative examples that vividly illustrated this for us. Thus, for example, much time passed between the appearance of the first NC machines and their utilization in the Berlin Brake Plant. Especially from an economic perspective, there were many reservations among the engineers and many arguments against the use of NC machines. This changed only by thoroughgoing political-ideological work. In the meantime, a large number of NC machines are in operation, and, in virtue of good preparation, they could even be brought over into production in record time. The right faith moves mountains!

Based on these experiences, the first industrial robots were deployed in the VEB Berlin Brake Plant at a fast rate. This had several reasons. For instance, the participating colleagues could quickly be convinced of the necessity of solving this problem rapidly. But an especially important factor was that the enterprise was not an individual fighter for technical progress, but a member of a community consisting of enterprises with the same interests.

The initiatives in the territory and the actions of the Development, Production, and User Association led to our first industrial robot starting trial operation on the eve of the 10th SED Congress: [illegible]

Our present estimate is as follows: This rapid development was good, because waiting helps noone. Only collaboration in mastering technical progress yields knowledge which pays off in the future. Besides the experience which we could gather for further applications, the first industrial robot also serves us as an aid for ideological work. This has already become effective in working out the deployment conception for industrial robots for the time period up to 1985. During the preparation for such deployment in scarcely a year, not everything went smoothly and without friction. There had to be mutual explanations, the discouraged had to be encouraged, difficulties that initially appeared insurmountable had to be overcome. A large number of employees had to be integrated into the preparation process. What was so specially important about mastering these tasks? What had to be guaranteed was strong leadership by the government leaders, with the enterprise director at the head. The enterprise Party organization paid great attention to the deployment of industrial robots. Regular control consultations based on a procedural plan, the assumption of robot deployment into the Party-Congress projects of the enterprise, the letting of Party contracts and their regular accounting before the APO (Department Party Organization) leadership for engineering and in the Party groups, the formation an initiative brigade under the leadership of the officiating director for engineering, all these are measures which influenced the successful course of the project. On this basis, many employees exhibited great initiatives. Each participant gave his best.

The decisive factor for the success of this project also was the super-enterprise community work within the framework of the Development, Production and User Association for Industrial Robots.

Finally, our honest estimate is that the VEB Berlin Brake Plant could not have mastered these tasks alone in the relatively short time.

The first industrial robot in our plant is the type IR 2, which was coupled with a lathe machine DS 2 CNC 600. A chuck part was processed with an annual number of 70,000 units. This technological unit consists of the lathe machine, the industrial robot, and the peripheral equipment in the form of two work piece storage units, a universal double gripper, the work piece clamping system, and the protective equipment. The technological unit is used in multi-machine operation with multi-spindle automatic chuck-lathes.

This solution was chosen to guarantee a high use effect. It is possible to process another work piece from the existing parts assortment, and this possibility can be achieved at a later time.

In coordination with the base organization of the FDJ (Free German Youth), the technological unit is being handed over as a Youth Project.

The use of further industrial robots and manipulators in our plant has already been conceptualized for the years 1982 through 1985 and will be made more precise following the 10th Party Congress. The future industrial robots will predominantly be integrated into existing production lines or into newly created production lines. The orientation here is to have several tool machines served by one industrial robot, to make work more easy, and in the future also to release working forces.

Dr. Karl Sorg, Plant Director, VEB Central Engineering Enterprise for Metallurgy:

As the scientific-technical center of the industrial branch on mining, metallurgy, and potash (ZIM), our enterprise has entrusted to it a high responsibility for making metallurgical processes more efficient. Corresponding to the decision of the Politburo of the Central Committee of the SED to develop refining metallurgy, the VEB ZIM has become the managing enterprise for the development, planning, and production of efficiency means such as robot technology, microelectronic equipment, and heat insulating materials, as well as for the construction of complete metallurgical furnaces. To solve this task, branch plants in Wittstock, Leipzig, Meissen, and Grieben were affiliated with the VEB ZIM.

This objective requires a complete reshaping of some plants, the integration of new technological processes, and the training of employees for new tasks.

The central plant in Berlin was reshaped from a forging operation to a powerful machine construction operation. Many important changes are connected with this, which begin with equipment, and extend through the production organization up to the training level of the employees. In order to implement this reshaping process successfully, the main point was to make the basic idea clear to the enterprise collective and to each individual employee. What we had to achieve was that each employee applied himself personally to this difficult and even uncomfortable task. This required courage to take risks and a high degree of insight into the need. Even today there are sceptical opinions, but these are being pushed back more and more, especially by the factual accomplishments. The enterprise Party organization and all Party groups accomplished a comprehensive ideological task of persuasion. The comrades took the leadership in the battle for the attainment of goals.

The principal objectives for this were decided upon in the battle program of the base organization. One component of the reshaping of the enterprise also is the double role of the VEB ZIM as robot producer and as user of robot technology.

Active participation in the EPAG greatly accelerated the deployment of robots in the ZIM. This resulted in a great step forward. Our enterpise goes over directly from hand-operated lathes to the use of robot-loaded NC machines. At the beginning, the engineers and workers scarcely had any knowledge for mastering such modern technology, and enormous efforts had to be and still must be undertaken to enable colleagues to program, operate, and maintain the systems. On the other hand, our enterprise made an important contribution within the EPAG. The sub-group "Technological Robots" is under the leadership of the enterprise director of the ZIM. The enterprise can transmit to other enterprises detailed information concerning the industrial robot ZIM 60 that has been built in the ZIM, and concerning the industrial robot ZIM 10, which is currently under development. The partners were stimulated to make the technological processes in their departments more efficient. Initial applications could already be conceptualized. Thus, the tasks of promoting the deployment of robot technology as rapidly and comprehensively as is possible under economic aspects has been effectively supported.

In Berlin, we began in July 1980 to work out specific plans for the deployment of industrial robots in the production departments of shaping tool production (including efficiency means - single production) and forging.

For this purpose, rough analyses were performed on suitable jobs, and deployment designs were worked out which subsequently were supplemented by detailed studies for high-priority cases. The selection gave higher priority to jobs where physically difficult and monotonous work could be eliminated or facilitated and, at the same time or with priority, savings of work and release of working forces became possible. This resulted in an overall design for the deployment of industrial robots. In honor of the Tenth Party Congress, the VEB ZIM delivered the 50th industrial robot ZIM 60. The robot ZIM 10, whose functional model was implemented for the 10th Party Congress, will already this year be used in our forging plant.

The success of robot utilization could be achieved in this short space of time only by precise planning and strict control as well as by the parallel work of planning, design, production, assembly, and testing. To prevent quality losses, the planners and designers were directly involved in working out the detailed task definitions for the peripheral systems for the deployment of the robot ZIM 60. The necessary information was therefore made accessible to them directly without time-consuming documentation.

Figure caption: An industrial robot "ZIM 60" in action, in the ZIM, the Central Engineering Enterprise for Metallurgy, Berlin. Here, in a drop-forging operation, it brings parts into an oven for pre-heating. It thus relieves the employees working from a physically difficult labor.

Our first two applications are the use of an IR2 from the production of the VEB BWF Marzahn at the NC lathe machine DF2 CNC 600 and the use of a ZIM 60 from production at the furnace of the forging press LZK 1000.

The first application was made with the support of the EPAG, but the second application we basically had to implement by ourselves. For both applications, the goal was to start up the system in honor of the 10th Party Congress in a battle program. Engineering worked out detailed task definitions and plans to prepare for the application, and these were coordinated and confirmed during basic consultations with the enterprise director.

Immediately thereafter, the two deployment collectives were formed.

For the last phase of the two application cases, we organized the work according to time-oriented networks, so that the deadlines could be met exactly.

An important management instrument also was the biweekly control consultations under the leadership of the enterprise director. In the presence of all responsible parties, the necessary specifications and decisions were here made.

What is the significance of the selective applications in a technical/technological perspective for the enterprise?

With the metal-cutting processes of shaping tools, especially for the turning of drop-forged parts, complicated surface-lathing work is required, which demands high craft skill. The individual form elements can be tested only roughly with the simple measurement tools customary in lathe work (vernier, micrometer screw). Altogether, this results in a high expenditure of time for the production of drop-forged parts with the proper quality. With the use of NC lathe machines, the total processing time should be shortened to about 30 to 40 percent of the previous expenditure. By the simultaneous use of loading robots for a portion of the anticipated NC lathe machines, we can furthermore achieve two-machine operation despite the complicated technological conditions.

With drop-forging, the other application case, there are relatively very frequent monotonous handling processes, which suggest themselves for automation. As an initial application for an industrial robot, we here selected the conduction of parts to their being heated in the V-grooved pulse furnace.

For this application, it was necessary to develop special peripheral equipment. This equipment accomplished the task of conducting the parts oriented in position (guidance of blanks). A combination was found with already existing and proven component solutions, which reduced the additional development effort.

A device was thus produced, which partially automated loading the V-grooved furnace. Full automation is anticipated by further peripheral equipment, after collecting and evaluating the appropriate use experience.

Both applications can be put in trial operation on schedule in honor of the 10th Party Congress. The experience gained thereby will help us during the coming year to achieve the necessary faster rate of deploying industrial robot technology.

Figure caption: In the Central Engineering Enterprise for Metallurgy, in the course of converting from a forging operation to efficiency-means construction, one dares to make a jump from conventional lathes to NC machines with industrial robot loading. An IR2 leads the parts being processed to an NC lathe VF2, and again withdraws the rough-finished goods (left picture). The devices developed in the TRO within the framework of the user community are used as intermediate storage units (picture right). Program-controlled production of semi-finished goods for forging dies has been started; the complicated production of various die impressions is being tested. The work of engineers and programmers will have a decisive effect on the success.

Jürgen Nitz, Plant Director, VEB Automatic Refrigeration

The activities of our enterprise in the development, production, and user community primarily comprise working out an operational use design, which was confirmed and supported by the leadership of the party, trade association, and enterprise. This Party-Congress project was included in the battle program of the BPO (Planned Party Organization). The personnel was thoroughly informed concerning the objective of beginning, at the time of the 10th Party Congress, test operation for the initial application, namely the turning of gear wheels and other rotation-symmetric parts in three-machine operation. The EPAG deployment conception was converted in the plant into a detailed process plan for all important preparation areas and for the relevant production collective. We formed a deployment collective at the proper time, to prepare for production, and we secured constant control of the course of the work through the APO Management and the Party groups, as well as the BPO Management, the BGL (Plant Labor Union Executive Board), and the enterprise managment.

Within the framework of technical preparations, the component assortment and the machine configuration were determined, among other things, and the technological project was worked out on the basis of the EPAG type project. At the same time, the engineers and the repair personnel (electronic technicians) were trained. Together with the transformer plant and the Berlin Brake Plant, we produced work piece storage units. Precisely with this production of storage units, universal grippers, and protective equipment, which are an example of the division of labor, all the enterprises exhibited a high degree of readiness for non-bureaucratic collaboration. In this way, the capacitive, technological, and material problems could be solved on schedule. The advantages of constructive socialist community work appeared clearly here!

In connection with technical preparations, we worked out a design for the deployment of industrial robots in our enterprise by 1985, which will be made more precise in the evaluation of the 10th Party Congress of the SED.

An important component of the preparation for deployment was the selection of young workers, capable of development, for the Party-Congress object. On 30 March 1981, this job was assigned to the young workers as a Central Youth Object. The iniative for this came from the comrades of the production area themselves. The impatience and the interest with which the younger colleagues look forward to working on the robots again proves how appropriate it is to transfer demanding and responsible tasks to young people. It is also quite logical that a colleague of the Youth Brigade now is applying for acceptance as a candidate of the SED.

Walter Liebig, Plant Director, VEB Berlin Metallurgical Works for Semi-finished Goods

Initial tests with an automatic industrial robot for operating a die-forging press have already been running in our plant since 1979. However, this did not bring the desired results, since the operating tempo with these robots fell short of expectations. Starting from this experience, we were very interested in community work with other enterprises to master industrial robot technology. The EPAG, formed in 1980, was therefore a welcome opportunity for us to approach the deployment of industrial robots jointly with other enterprises. We set as our objective to use a robot of the type IR 2/S II in our plant in combination with a highly productive tool machine, by the time of the 10th Party Congress. At the same time, we wanted to make our contribution in our working share of the process of fabricating peripheral equipment.

Due to the exemplary leadership of the user association and due to the flexible coordination of deployment preparation, it was possible to deliver the required technical equipment beginning in February 1981, to install this equipment and to begin testing. We deployed the first IR 2/S II in compound slide-bearing operation. Here, it is used to load a chuck lathe with microprocessor control system of type DF2 CNC 600. This use suggested itself because, despite an already high degree of automation in slide-bearing production, monotonous and partly heavy lifting work must still be performed to a considerable extent at several conventional tool machines.

When the preparations for the deployment of the IR 2/S II were begun, the ideological preparation within the collective of the slide-bearing plant was also begun. Nevertheless, there were not a few skeptics who regarded the rapid deployment of this technology as impossible. In the meantime, they convinced themselves that, by concentrating all forces, even such new technology can rapidly be prepared and introduced for deployment. The technological unit, consisting of the robot, the chuck lathe machine, and peripheral equipment, such as storage, grippers, protective fences, etc., has been constructed, and test operation can be begun for the Party Congress. An essential role in this process is played by the work of the Party actives and also by the repeated support of the district management of the SED in Berlin.

After the technological unit with the IR 2/S II has been started up, work is far from having been completed. Problems must still be solved, such as the improvement of production organization and the securing of maximum load for this new technology. The lot sizes must be coordinated with the objective of processing the largest possible assortments on the highly productive unit NC-tool machine/industrial robot. Furthermore, an adaptation and/or revision of production technologies is necessary. Thus, we are endeavoring to optimize the production times with respect to the loading rate of the industrial robot, to optimize the tool lifetimes, and to improve the work piece planning system. In the short time available, two engineers have by now been trained to program and operate the system. These two colleagues are perfecting their knowledge and skills during the test run, in order to be able to properly instruct the technicians who are intended to operate the system. The user training of the operating personnel should still be qualified primarily for the micro-electronically controlled tool machines, in collaboration with the manufacturer enterprise.

In parallel with the application described above, our enterprise was involved in consultations and preparations for other applications in the collective. Thus, a design for deployment up to 1985 is being worked out, which already now anticipates some new applications for industrial robots. For example, a ZIM robot is supposed to be used to operate two NC lathe machines in the construction of operating means. An industrial robot of type IR p I will be used to operate the punch in the stamping plant, and a ZIM 60 will in the future serve to eliminate the heavy work at a pig-iron casting machine. There it will withdraw and stack pigs. We anticipate that an IR 2/S II and/or its further development will be used at other NC lathe machines in the slide-bearing plant. Some types, which have yet been precisely determined, are to be used for loading powder presses, for operating punches in consumer goods production, and for other tasks.

The basic decision has already been made for one of these applications. This robot of type ZIM 60 is to operate numerically controlled tool machines for the production of pressing tools. The solution of the task promises a significant stabilization and expansion of tool production, which up to now has been a bottleneck for us. This project will be prepared and performed according to the already tested system of the leadership. The other applications up to 1985 also involve difficult tasks for the enterprise. For this reason, it is necessary to organize the use of industrial robots in good time within the planning process, and step-by-step also to restrict the increased management efforts.

Figure caption: In the compound slide-bearing plant of the Berlin Metallurgical Works and Plant for Semi-finished Goods, IR 2/S II is used to load a chuck lathe machine DF2. This deployment center will also become a site of active exchange of experience.

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ROUNDTABLE DISCUSSES COMPUTER RESEARCH SPECIFICS

Budapest SZAMITASTECHNIKA in Hungarian May 81, Jun 81

[May 81 pp 4-5]

[Text] Since we have reported on foreign achievements we will deal in the sixth part of our series with the opinions of those involved, and in our following reports we will deal with the state and achievements of domestic research.

The ever-newer versions and generations of sequential Neumann-principle computers no longer "shake up" computer technicians. The first parallel system computers--based on modern electronic elements--appeared almost unnoticed in the middle 1960's. The reception and judgment of them still generates stormy debates. The spread and use of them has accelerated only recently. Even this acceleration is relative. There are or would be enough tasks which could be carried out in parallel (for example, parallel natural and industrial systems).

Elements operating in parallel are just now appearing in solid form in the ESZR [Uniform Computer Technology System], in the ES 1035 and ES 1055. Researchers everywhere, and this applies not only to the domestic ones, anticipate the developers and manufacturers. Among us--it appears--the difference between them is even greater than customary in the world. This is partly because, we feel, the domestic treatment of the theme lags behind its significance.

To prepare for these parts of our series the editors of our journal organized a roundtable conference to which we invited, in addition to a few of those responsible for guidance, representatives of three research trends, potential manufacturers and a few experts who had helped the preparation of the series with their professional advice:

Mihaly Sandory, candidate in technical sciences, deputy chief director of the KFKI [Central Physics Research Institute]:
Tibor Vamos, Academician, director of the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences], chairman of the NJSZT [Janos Neumann Society of Computer Technology];
Kalman Bolotai, electrical engineer, technical deputy director of the VILATI [Institute of Electrical Automation];
Peter Braun, electrical engineer, chief of the VEIKI [Electric Power Industry Research Institute] Computer Center;

Gabor David, mathematician, scientific group chief at the MTA SZTAKI;
Andor Dobo, mathematician, technical-economics adviser to KG Informatik;
Andras Doman, electrical engineer, scientific worker at the SZKI [Computer Technology Coordination Institute];
Balint Domolki, mathematician, candidate in mathematical sciences, chief of the SZKI Theoretical Laboratory;
Gyula Fay, physicist, candidate in physical sciences, a chief scientific worker at the MTA Technical Chemistry Research Institute;
Janos Gantner, director of the Videoton Developmental Institute;
Lajos Janaki, electrical engineer, chief of the VILATI Computer Technology Applications Technology maind department;
Miklos Kaszas, electrical engineer, a department chief for the computer center of the Hungarian State Lorand Eotvos Geophysics Institute;
Tamas Kovacs, physicist, inventor;
Tamas Legendi, mathematician, a scientific worker of the MTA Automat Theory Research Group (Szeged);
Karoly Stuka, mathematician, department chief for the SZKCP [Computer Technology Central Target Program] Office of the OMFB [National Technical Development Committee]; and
Janos Szalai-Nagy, electrical engineer, deputy chief engineer of the VILATI.

We make no secret of the fact that with our series of articles and by organizing our conference we wanted, in addition to informing our readers, to provide a forum where researchers could meet and come closer to one another and to the manufacturers.

If the program found a good response then it succeeded in turning both research and manufacture toward the user. Our intention in this regard corresponds to the exceptions of the Sixth Five-Year Plan and to the professional policy goals of our journal.

We asked Mihaly Sandory to give an introduction to start the debate. A debate followed his presentation.

Sandory:

The three trends which we will be reporting on are not competing with one another. The question is not which is the better. What I would like to talk about, instead of starting a debate, is how these three research trends--the theme of parallel processing--fit into computer technology. Let me warn you that my views are rather extreme. Let me give an example. In my opinion, the only thing that would be a greater blow to our economy than to suddenly get an extremely large-capacity computer would be to get a computer with even greater capacity than that. We really met up with computer technology for the first time at the end of the 1940's, the beginning of the 1950's. What has changed since then? What has not changed? In my opinion, the only thing we can do now is what Janos Neumann outlined. I feel that the applications sphere for computer technology has changed somewhat and the hardware base has changed too. But the method of solving tasks has not changed and the architecture is just beginning to change. The following few thoughts will illustrate the situation characteristic of the end of the 1940's.

Computer technology was used to solve mathematical tasks--differential equations, linear and nonlinear equation systems. Meteorology, for example, was a promising applications area. Reviewing the prospects for applications, Janos Neumann noted that such a (meteorological) task would not require much more operational storage capacity--a few K--than was then being used. Today computer technology is not being used primarily to solve mathematical tasks, most of it is not being used for this.

At the end of the 1940's the reliability of equipment was characterized by a few hours MTBF (mean time between failures). Solutions had to be designed so that the probability of a faultless run was significantly greater than zero. In designing solutions today the reliability of the equipment is no longer a primary consideration. In regard to the speed of elementary operations, I might mention a few milliseconds at the end of the 1940's--to be polite. Today we are around a few nanoseconds.

The number of logic elements built into a single system can be characterized in many ways. As opposed to a storage of 4,000 words (not random access in the present sense but still something which could be called operational) a storage capacity of 10 M bytes is not so fantastic today. What has to be compared to the 4 K of that time would today be over a G byte. A good programmer then, and today also, produced, or produces, a program of about 10 instructions without an error. But today this is done in such high-level languages that we again have a different order of magnitude from the viewpoint of the task. If I start to add up these figures then, depending on one's temperament, if I may say such a thing, our possibilities have increased by 12-14-16 orders of magnitude. I know of no example in the history of mankind where quantitative changes of this order of magnitude did not cause a revolutionary qualitative change. It is my feeling that this revolutionary change has not yet taken place in this profession.

Speaking of task solution, Janos Neumann said that an intelligent man prepares the solution for a stupid machine. The machine cannot take part in the preparation. Thereafter the machine can execute the task even without the intelligent man (disregarding the operators). This model worked almost without change up to the beginning of the 1970's. Even today we pursue this model in most fields. The first initiative which was able to go beyond this--as far as I know--was in the area of designing computer technology devices and machine industry, construction, etc., tools. Even here they insisted for a while that filters, resistance networks, etc., had to be designed with a computer. When they faced slightly more complicated tasks they invented the suffix "aided" to help them take the next step. They could no longer design "with" a computer but the computer could aid the design. This is one area where another step would be timely and where it would really mean a revolutionary change. Naturally there are new initiatives, but I do not know of any considerable achievements. This might be one of the chief questions--in my opinion it is the crucial question--in the application of computer technology.

I would like to mention a few more thoughts in connection with the direction in which we might progress. We might introduce learning, artificial intelligence, or some more limited interpretation of these, the acquisition of experience into problem solving. In the introduction I mentioned meteorology. One can make a meterological forecast in two ways. Either we have one great world model and, using this, beginning with data measured in Siberia, we feed everything into a computer and a huge program processes the whole thing and predicts: "Tomorrow it will be 12 degrees Celsius above zero...," and the next day a person sinks into the snow on Szabadsag Mountain. Or we could do it like the Balaton fisherman who does not know what a world model is or where Siberia is; he looks over to the other shore and says with great certainty what the weather will be like tomorrow, and you can count on it.

The one is a sort of learning process, acquiring experience, a process of applying information to a new area. And so is the other.

Artificial intelligence research insists on a more demanding solution to the problem. In my judgment, however, the technical possibilities are still capable of serving only a less demanding method.

The second big question (we are now going beyond problem solving) is architecture. There are two essential things here. In the first place let us look at the address. In our computer technology devices the data, instructions, etc., must have some sort of address, true or virtual, because that is how we find and use them. Database management has raised the possibility of associative access, access according to content. We can already see results in a narrow applications area. Even today, in a task where the largest part of the costs of problem solving are made up of a large peripheral (large background storage), it is not incredible to say that we could address according to content. We could read into the operational store only the relevant information from a background storage. This is not much compared to what even a 3-4-year-old child could do in regard to addressing by content--at the level of association. The question also arises whether we need to be as deterministic as we try to be in solving the entire task. Might it not be possible to tolerate a little uncertainty? Permitting some uncertainty would not only make the whole thing more human but probably it would also have an effect on the "philosophy" of problem solving if we did not stick so strictly to determinism. Associative storage elements already exist on single 2-inch or 3-inch silicon sheets. They are not for sale but one can see them and work with them--if not in the area of Greater Budapest. This trend is very promising. According to estimates, if the number of elements is improved by two to three orders of magnitude, increasing element density, then the present technical-economic difficulties can be overcome.

The last question area to be examined is parallelism, which Neumann said there was no need for. He added that if there are two of something, that is not yet parallelism because one of them is the bottleneck. Parallelism is the parallelism of problem solving. We have already heard in the introduction that there has been very significant progress in this area in the last 6-7 years in several directions. But I would like to note that the restriction which Neumann made is still sensible. It is well known that two elements working in parallel (which cost twice as much as one element or a little bit more, because we always invent something which must be built between them) is not a "well-engineered" design. The efficient solution of a task is not simply a "parallel" something. According to some, performance can increase as the square of the price, according to others it can increase exponentially. So simple *parallelism is not efficient.*

Those ideas about which there will be talk at this conference will not only make things parallel. They will be attempting a parallel organization of problem solving and of the entire system.

So, to sum up: Parallelism is an essential area where there are possibilities for progress, not only in general but concretely for us too. And I even hazard that there is also a possibility for progress suitable for direct practical use.

In my opinion, however, this is not the only, chief, or most important problem of the basic problems of computer technology. Starting with problem solving we must bring something new into our lives and in a manner similar to what we tried in associative solutions--and not "synthetically associative" solutions--there may be gradual progress in the other questions also. In a 1-year seminar series which ended the middle of last year we examined all the possibilities for progress and, if my deductions are good, a much better path cannot be seen even today (as compared to the others). In my opinion, a correct--if unaccustomed--way to distribute the moneys intended for research would be that if the task were assigned to me then I would proceed as follows: I would look to see where the best proven experts were and I would concentrate on that area. The differences between areas are not so great that I would not attribute greater significance to whether someone really achieved what he set out to do.

Debate

Domolki:

In reviewing the development of computer technology there was mention, among other things, of the fact that, for example, the time between failures is no longer a limiting factor in the execution of tasks and there was mention of a development of some 12-14 orders of magnitude. In this connection, one must point out a new limiting factor which did not exist in the past. I mean the limitations deriving from the complexity of the software, that is, the size of the task which one man or one group of people, with the aid of the technologies at our disposal, is able to formulate. It is probable that the limits deriving from this are already a substantial constraint on that development of 12-14 orders of magnitude! Why do I say this? Because I feel that one might imagine here a possible bridge between the two developmental trends mentioned. One is the need to revolutionize problem solving and the other is making use of parallelism; in essence, to increase "fieldless" computer-technology capacity. If we are to overcome this software limitation it is probable that we will need programming technologies which are very machine intensive, both in program development and in the course of executing the program produced. I would like to refer here to the applications of computer-aided design in software design and preparation. If such methods are to be used acceptably there will be, among other things, a need for a great increase in performance, which only parallelism can ensure.

In a slightly different vein I would like to mention the problem of artificial intelligence--not limiting it to learning. I believe that only an intensive use of the tools of artificial intelligence in programming will bring the mentioned revolutionization in the method of problem solving. I will not go into detail now because the theme today is not primarily concerned with this.

Sandory

You are touching on the two great "blows" mentioned jestingly here. My question is: Who will "teleprogram" this great computer technology achievement and who will use it? I am in agreement with Balint Domolik in that what I also consider necessary is the preparation for problem solving.

Stuka:

The first idea is really very true and I can very much agree with it; not only would such a computer be a great blow to society but also to computer technology itself. For the past 2 years, 70 percent of the software society of the world has been writing assemblers, editors, text editors, monitors and the like and they are continuing to write them as a function of the development of microprocessors. If a new type of architecture should appear, then we would begin to make analogous tools for these. I have no debate with the methods for distributing developmental moneys but I would like to inquire into it better. In my opinion, the developmental moneys should be put where we are best--and we have achieved rather nice results in this cell automat thing, compared to what we have invested in it. So my question is whether you have a somewhat more concrete opinion about this question.

Sandory:

It is not because Tibor Vamos and Tamas Legendi are sitting opposite me, but I would like to say again, and more concretely, that if there were some money for research and development I would not consider it a clever policy to say, "Dear Comrade Vamos, you are the only academician in the trade, the key question now is the 'philosophy' of problem solving, you put together your group and you will get the money to develop a 'philosophy' of problem solving." We must work in a direction in which we have proven ourselves. Or let us take Tamas Legendi; he deals with cell automats. The direction in which he has started has certainly achieved something more than threshold results and a correct research policy should support this. If I were not the "science guide" then I might say that I am not faced with two--Tibor Vamos and Tamas Legendi--but, let us say, seven; and why should one be worse than the other? But if the seven represented a group ("school" is a big word) which could achieve results really recognized even at the international level, then I would not hesitate to say that however good an idea an eighth might be (and whoever's nephew discovered it) we should not deal with it. I do not want to make propaganda for these two groups, but we should stay where we have achieved something already and not try to guide research with some pretext or ideology. From a certain viewpoint, software technology is obviously one of the fields to be cultivated. (Balint Domolki has already used this expression.) Software technology also is an area where we have already achieved results and which must certainly be supported, although sometimes this can cause something like a nationally stressed program or the development of software technology for a nationally stressed process. This gets to sounding a little childish; a man who knows how can do it; he doesn't need us to make a nationally stressed program out of it. And a computer-technology community of domestic size cannot hope to make a breakthrough in this area. In this or that narrow area of cell processing or artificial intelligence--I do not want to omit anything--it can be imagined that there might be a recognized breakthrough with the resources available in Hungary.

Vamos:

If I may add something to and reaffirm what Mihaly Sandory has said then I may be able to anticipate a few questions. If a good idea comes up, what policy do we follow? In general, that of the MTA, that a written draft should precede the debate. If the person who thought up the ideas can put the question in an acceptable and "professional" mathematical form--I am taking mathematics in its broader sense here--in accordance with the strictness of mathematics then he writes it down and then it can be debated because this is a basis for debate and not a collection of drummed up slogans, a conglomerate of ideas collected from various international journals. If the dissertation is beautiful, good and sensible than one says: There is that beautiful IBM computer, be so kind as to make a model of more acceptable scale thereon, something in which the complexity of the problem will appear in some form also, not just a simplification. It is certain that we cannot permit a researcher to go out, like a child, and buy 50 chips and start to fabricate something out of them. If he finishes this second phase, then we can make comparisons, what can be achieved in a given task in terms of operational speed and other characteristics. If all this has been done, then we can examine how it can be realized at the given technological level. If we follow these steps, then we do not have the question of whether or not to allocate money for such a "work"; the whole thing fits into the natural process of the progress of research.

Dobo:

I feel that friend Stuka has taken a preventive approach in his posing of the question, from both sides. Following this I come up with the following idea. What would have happened if, at the initiative pertaining to the manufacture of the atom bomb, Jeno Wigner, Leo Szilard and the others had received the answer: "Gentlemen, you will get everything you need, but first make an atom bomb and prove that it is good for the intended purpose."

Sandory:

As I understand it, the atom bomb was one of two possibilities, they started two programs, the rocket thing and the atom bomb. I do not see two such things today. The computer-technology world war is before us, and we cannot designate two such things upon which we must concentrate. We cannot say anything more clever than: My friends, deal with what you understand. It may be that 1 year from now or 2 years from now the situation may change, as a result of chance or a deliberate discovery, and we will be able to say that there is this program and that program--the atom bomb and the rocket thing--and we must concentrate on them. I do not see such a thing today, although at the year-long seminar series mentioned we went through the world literature very conscientiously and in detail. Many brought direct experience from very many places abroad. There was only one thing in which, if I may say so, we agreed and that was this: There is no single best possibility. There are many equivalent things of equal rank, and this seems to be the opinion in official research guidance also. In February of this year the first secretary of the MTA said, in connection with stressed themes, that in the area of automation we should regard as stressed research that research which we were doing and we should not try to think up one theme and say that it was the stressed theme.

Dobo:

Then let me put it differently. I do not know if it is correct to take this wait-and-see position simply because for the moment I do not see a problem the size of the atom bomb. Nor am I convinced, and this is not distrust of the talents and abilities of the representatives of the profession, that we will come with a correct judgment however much we survey a thing. They analyzed the situation of the atom bomb in many countries. Very many countries came to the position that they could not have an atom bomb within a foreseeable time. But I am afraid that simply because we do not see a great task, that does not mean that there is no great task. In the second place, neither am I convinced that we have to see a great task, because what we do not feel to be a great task today may become one the day after tomorrow.

Stuka:

In a word, what Mihaly Sandory said can be applied to that part of the money which we can turn to research and development. Many justly ask the question: Where are these moneys coming from? Where are they coming from, where are they generated and what percentage, by international standards, can be turned to basic research? So my question would be: Can we turn larger sums to basic research purposes? Is there a realistic prospect that the branches producing the wood will get something back within a realistic time?

David:

I feel that what we are talking about here is a gate that is opening or is already open, more precisely, we are talking about knocking at open gates. This is partly because even Karoly Stuka has represented the SZKCP. It is my feeling that in the past 3 years a part of the moneys handled by you have gone where the new research is. (It is not certain that money went to every such place!) And if we can talk about opening gates--thus not about a finalized document--then I might say the following: In our upcoming plans there are four themes in architecture. Three of these are linked very closely to parallelism. One is parallel at a very high level (the cell automat trend); another is the architecture of adequate computers which might be developed in accordance with a better structure of the problem class; the third is the architecture of computers which reflect and aid problem solving. These themes figure in the plan proposal.

Sandory:

I am a disciplined citizen. That sphere about which we are now speaking is a part of culture. On the basis of "small change"--with a shortsighted view--we cannot see research except as a series of different things; so we must think of a longer term. The weight of technical development is entirely different; naturally, the fields are contiguous. Let me hazard here a "supplementary position." If reseachers who understand what they are doing develop something, then technical development is more likely to achieve research results (which later can be made into products) than if they developed something in some field simply to have something which could be sold well on the world market. But I recommend this model for research goalsetting expressly for the allocation of moneys decided on by the MTA. Technical development funds must be distributed according to different viewpoints; but a part of the technical development fund will obviously have a mutual effect with a part of the moneys turned to pure research. I do not want to influence opinions, but in SZKCP matters (for example, long-range research--if there is any) we should not choose as a theme what one reads about in ELECTRONICS or in the COMMUNICATIONS OF THE ACM but rather what someone can really do here at home.

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[Text] Many in Hungary are dealing with parallel processors or cell processors; they are interested in this, publishing about it and reading about it in the literature. But there are relatively few who have been able to achieve new results in this field. It would be difficult to determine the reason for this. In a complex way this is influenced by such factors as centrally supported research, the medium in which researchers exercise or can exercise their activity, the technology or element base at their disposal, prices, knowledge of user needs, cooperativeness, industrial interest or incentive and the official judgment of this or that trend. But the adherence to traditional sequential systems may contribute to these causes also. I feel that it is an impossibility to list the causes of this in an accusatory manner. The arguments of our researchers, the opinions voiced in debates, clarify much. Our editors cannot take a position but we are providing a forum for these opinions and differences.

Of those researchers who want to achieve new results let us introduce three Hungarian researchers who represent three paths in the area of research on parallel systems and cell processors: Andras Doman, Gyula Fay and Tamas Legendi.

(The introduction of the researchers and their work is by the editors; then the researchers themselves report on their achievements.)

Paradocs and Dataflow

Andras Doman has been dealing for several years with general questions of parallel information processing and high-speed computation. In connection with this, he is doing research on a computer using the Dataflow principle and as a result of this he has developed a basic model for a large parallel computer with distributed control, a model which includes the operating principle, architecture programming system and basic applications. Small-scale experimental construction of the proposed computer is under way. His research in the past 3 years was done on a postgraduate scholarship; one condition for successful further research is that the work go beyond its one-man nature and link up with other areas as a result of appropriate concentration.

In addition to his foreign articles, Andras Doman has significant domestic publications (for example, a professional bibliography) and lectures with which he has tried to acquaint others with foreign results and the important theme of parallel computer systems.

The goal of Andras Doman's research on computer architecture was to develop a model which would have a high degree of parallelism; it should have simple construction, be receptive to the newest LSI/VLSI technology and be effective for the solution of universal tasks but especially of tasks demanding much calculation and of tasks involving essential parallelism. The name of the proposed computer is Paradocs; it is a Dataflow computer with a high degree of parallelism. The four parts of the work connected with the computer model are:

--developing a basic model incorporating the operational principle;

--developing the architecture (system, processor, processor element);

--developing a programming language to fit the basic model or atchitecture; and

--developing applications areas and algorithms.

The operation of Paradocs is based on the so-called Dataflow conception, the most important basic thesis of which is that the computing process can be broken down into elementary operators, linked with data channels and that these operators be executed when, and only when, all arguments (operands) are available. Its chief advantages are:

--data control (instead of central sequential control);

--the possibility of maximal (microscopic) parallelism without the necessity of explicit synchronization;

--a deterministic parallel computer model; and

--the computing model does not contain a traditional central storage.

Based on a modified version of the basic Dataflow model the Paradocs computer provides for simple realizability, distributed control and unlimited expandability.

Its architecture is essentially a block-structured network of uniform processor elements in which every processor--imagined as grid points in a three-dimensional space--can exchange information with six other processors. By "programming" in this so-called physical configuration, one can develop a logical configuration which is a representation of the Dataflow graph of the algorithm to be solved.

Transformation statically assigns to the processor elements a singel operator (direct implementation) or a substructure consisting of several operators. In the complete computing system, the Dataflow processor is the control computer (host) linked to the processor.

The Dataflow language (DFLL) recommended for the computer is a SIMULA-67 base functional language implemented on a CDC-3300 computer. A high-level applicative

Dataflow language which also contains data structures is now being implemented on a PROLOG base.

Efficient applications areas for Paradocs include tasks which have algorithms which are well structured in the geometric sense, have a pipeline character, are essentially parallel, etc.

Applications areas which have been developed or proposed are: real-time processing, linear equations, ordering, querying, picture processing, nonnumeric processing, etc.

Doman:

Performance-oriented computer architectures occupy a leading place among developmental trends in computer architecture and these include parallel computers or, to use the "vulgar" expression, supercomputers. The requirements which arise in connection with research can be put essentially into three main groups:

--A radical increase in performance at an acceptable price. This radical increase means an increase in speed which results in a qualitative change. Thus it becomes possible to carry out tasks which could not be carried out earlier due to speed limitations. Some estimate that the speed of these supercomputers will have to fall in the region of 1 billion operations per second in order to attain this qualitative change.

--A great development of present technology, which will pose certain changed requirements in connection with architecture. This includes such requirements as, for example, using as many elements as possible, elements which are relatively highly integrated and limited to a few types and which are placed as far as possible in some regular connecting structure.

--A requirement connected with programming problems. The programming systems must make it possible to fully exploit the new architectural possibilities from the user side and must ensure simplicity and verifiability of programming. It can be seen that the first and third requirements are in serious contradiction with one another, at least within the frameworks of traditional architecture and programming systems.

Let us return to the radical increase in computing performance which, since we are talking about parallelism, will require a large number of processor elements. The basic problem is to get this large number of processors to work together. The following ideas arise in connection with the type of computing system which would be capable of such high performance: It should have distributed control (because central control is the thing which represents the actual limit on increasing speed); insofar as possible, communication between the several elements should be local, without centralized communication (because this is required by distributed control and processing).

All these considerations have led many researchers to the trend of so-called Dataflow or data-controlled computer architecture.

The Dataflow computing model tries to satisfy, in a computing system, the natural requirement that the execution of the several instructions should take place if the arguments of the instruction are already available. This is a natural requirement in traditional programming, too, but only in an implicit manner, is it reflected in the structure of the user program, but with a Dataflow system this is ensured by the execution mechanism. This is an important idea because this makes possible the conflict-free cooperation of various computing processes; at the same time, central control and other central resources are "eliminated" from this conception. The advantages of Dataflow computing systems are already well known: maximal (microscopic level) parallelism, asynchronicity, determinism, freedom from side effects, etc.

My work is directed at the development of a model of a parallel computer which can make use of the advantages of the Dataflow principle to a large extent in an actual architecture which can be easily realized.

During task solution, the algorithm can always be given in the form of a computing graph and, adjusting the Dataflow executive mechanism to this, we get the Dataflow graph, which is the basic machine language for a Dataflow computer. The task to be solved was a double one: In the first place to provide a principle and a tool for providing the algorithm--this is the modified Dataflow model (DEM) and the developed Dataflow language; in the second place we had to develop the architecture for a Dataflow computer which interprets the basic machine language.

The architecture is a special one with completely distributed control which contains a large number of identical processor elements in a regular geometric linkage. This choice resulted in the inclusion of the advantageous properties of cell automats in the architecture and the architecture shows a structural similarity to an algorithm in which parallelism and the speed requirement are critical. The operation of the computer consists of two phases: Loading, in the course of which a representation of the Dataflow graph (logical configuration) is loaded into the cell-like processors (physical configuration); the second phase is operation, during which the logical configuration continuously realizes the Dataflow executive mechanism. The biggest problem for this system is that it requires a very large number of processors and these processors are not fully exploited. At the same time, this system can provide maximal parallelism. As one solution to the problems which arose we developed an alternative architectural model which requires a substantially fewer number of elements with high exploitation of the processor elements. Here the individual processor elements do not represent a single "software operator" but rather they execute sequentially the larger partial structures of the Dataflow graph--preserving operation according to the Dataflow principle and preserving the cell-like architecture.

Experimental realization of the proposed basic model is under way. Within the framework of a research contract signed between the MTA SZTAKI and the BME [Budapest Technical University] we are constructing six to eight processor elements and the associated interface. In the full system, the Dataflow processor will be a linked processor to the central control (host) processor which also carries out communication tasks.

The other areas of research, in addition to the computing model and the architecture, are: development of Dataflow programming languages and discovering applications possibilities. I worked out and implemented in the SIMULA-67 language a Dataflow programming language which is a simple descriptive language for optional parallel algorithms. A high-level applicative Dataflow language is also under development; it too will handle complex data structures. A very important area of research is the discovery of applications possibilities. We are considering tasks which can be solved much more efficiently on a parallel Dataflow computer than in traditional computing systems. A few of these are: real-time processing, matrix operations, large-scale physical models, picture processing, nonnumeric processing, etc. For the most part, the algorithms for these tasks have substantial parallelism (a large number of identical computing patterns), they are of the pipeline type, interactive algorithms and well-structured parallel algorithms.

I feel that further research will be given a great impetus with the appearance of concrete applications needs and with the development of broader domestic and international professional contacts or cooperation.

MIND-80

Cell automat research began in Hungary in 1972 at the initiative of Gyula Fay.

For a period of 2 years the Lorand Eotvos Science University held a special collegium (for physics and mathematics students) and several who got their degrees as a result became co-authors of the anthology titled "Cell Automats" [Sejtautomatak] which appeared in 1978.

Among the first to join the work of the team formed under the leadership of Gyula Fay were Andras Doman and Tamas Legendi, who have developed independent research areas since then. Their present research is directed at a systems technology synthesis of personal computers and cell automats. The basic idea was given by a 1976 patent, held jointly with Tamas Kovacs, which was realized in 1980 in a computer named MIND. As for the theoretical approach, Gyula Fay considers himself a follower of the Aladyev type cell automat school working in the Soviet Union and he is striving for implementation on an ESZR base.

The MIND-80 is a protable personal computer. Its purpose is to increase or enhance the intelligence of the user in the broadest possible sphere of situations. This is why it has the acronym MIND--an artificial intelligence-increasing dialog partner.

In construction, it is a microelectronic device based on a microprocessor and it contains 1x8080, 8x2147, 8x2708 and 1x8253 integrated circuits. In regard to operational mode, it is an adaptive automatic system with model reference.

Since it is an adaptive system, its operation is constantly formed by cooperation with a human. Its being a model reference system means that its built-in programs presume an average general school education of the partner. In the course of cooperation with a human, the computer constantly measures the information level and degree of intelligence of the partner. (By watching the number and character of the error messages required.) In accordance with this, it constantly modifies its partner model and in this way it condenses or details its messages (redundancy-adaptation) in the course of the dialog. In this way, getting acquainted with and cooperating with the computer are inseparably intertwined and the total capacity of the man-machine system develops in accordance with the intellectual capacities and will of the human.

In the course of cooperation with the computer at a suitable informational level of the partner, it becomes possible to gradually eliminate the design deficiencies of the machine and the errors which arise in the meantime and to develop new functions; that is, system development becomes possible also.

It is an automatic system. This means that the functional system of signals used with the human develops via a system of human influences, machine conditions and feedback signals (a fivefold system consisting of input-condition-output-new-condition-new output).

In accordance with the cell-automat principle, identical models of the MIND computer can be linked together theoretically without limit and thus their capacity can be combined. Thus they are capable of taking the place of large computers. This is made possible by the fact that present microprocessors are capable of mechanical self-isolation ("hardware-triggered hold state"), thus making their stores free to neighboring machines, presuming that in every environment only one machine is connected to the data and address channel. In the case of the INTEL 8080 microprocessor, the isolation ties down an entire five-phase machine cycle (maximum of 2.5 seconds). This includes the time needed to communicate the prior state and read the state. Since the MIND computer does not have peripherals in the systems-technology sense (its operator console and display are also directly addressable stores), the exchange of information concerning the state of neighboring machines ties down at most two machine cycles (together this surely can be kept under 10 microseconds). Data traffic can be ensured with a transmission frequency of 100 kHz.

There is no need for any sort of separate switching time or sequential-parallel (modem) transformation. There is no code generation, parity check, correction, etc., and no extra software work because the computers use the store of neighboring machines as their own. This takes place via hardware so there is no separate time requirement. The development of MIND states and temporary funcitons takes place with standard cell-automat techniques.

Fay:

Demostic cell-automat research began in 1972 in a Budapest organizational institute, the KGM ISZSZI [Institute of Industrial Manggement, Organization and Computer Technology of the Ministry of Metallurgy and the Machine Industry]. The idea arose in connection with organizational work being done for Videoton. The research work, supported by several million forints, lasted 1 or 2 years, then the institute was reorganized and the work connected with this ended. But research continued in another place. The role of Tamas Legendi, especially, was significant; since then a regular school has developed around him in Szeged.

A new direction came into being when I got in contact with Tamas Kovacs. It was his idea that the microprocessor idea, which was appearing and fashionable then, might be combined with the cell-automat idea. The patent for the MIND personal computer came in 1976 and the machine itself in 1980.

Adaptive production control is the chief applications area for the MIND system. Its chief design principles and orientation (its "philosophy") can be summarized as follows:

--It attempts to achieve environmental balance, that is, to see that the speed of input-output processes (thanks to a high degree of hardware parallelism) approaches the speed of internal (central) data processing. This is done by connecting and disconnecting the individual cells. As far as we know, the concept of environment is explained only by the thermodynamics of processes which cannot change direction, by environment economics and by topology. Not by computer science. This is the reason that peripherals are usually treated differently in principle from stores. An indication of this is the fact, for example, that the INTEL 8080 microprocessor has separate OUT and INP condition indicators for handling peripherals and the fact that the firms manufacturing electronic keyboards (for example, Haussmann) supply the keyboards with expensive electronic cycle protection when they make them for microprocessor peripherals. (Naturally these are completely superfluous when we treat the peripheral uniformly with the store--from the conceptual viewpoint.) The distinction of a contraentity concept of the environment (in our opinion, false and distorted) is entirely alien to the cell-automat view. In microprocessor system technology this approach merits the designation "Memory Mapped I/O" (see, for example, the "MCS 80/85 TM Family User's Manual," published by Intel Corp, Santa Clara, California, USA, October 1979); to its detriment they say that "it takes addresses from storage" and "requires 3 byte instructions (LHLD, SHLD) instead of 2 byte instructions (IN,OUT)." We do not agree with this.

--In the accelerated development of computer technology the formalism of a contra-process description of results is tilted entirely toward the process side (procedurality) while th the classic chapters of mathematics the recording of results (usually in the form of equations and formulas) is exact and formal and the description of process is loose and verbal (we think of such expressions as "let us note that.." or "let us substitute..."); the situation is turned around in computer technology. Result description is verbal and limited to the COMMENT column, and thus it becomes loose, while the description of processes takes place in formalized program languages. In the MIND system we are trying to eliminate this essential difference. The developers of the MIND see the cause of the well-known sorry efficiency of software development in the fact that it is simple absurd to seek errors and correct errors in formal systems (such as programs) with essentially verbal tools.

It should be noted that the formalism of a uniform description of results and process was worked out well before computer technology in the "Principia Mathematica' of Whitehead and Russell.

--In the development of the MIND system we are also striving for a natural balance of the man-machine link. As is well known the time-sharing system discovered by Gabor Kemeny represented the first step in the direction of a "human collective-machine" link on the path of the development of the man-machine link. The next natural step will be when human collectives face machine collectives (computer networks). Human thinking is a social product and could not have come into being without human collectives (social groups). Computer networks can be conceived of as extensions of the collective thinking abilities and organs of social groups of humans in contact with computers (with their structured systems) and using them as tools of production. This means--going beyond the customary relationships of time-sharing systems--that we attribute a crucial role to an enrichment of the communication relationships among the members of the collective in contact with the computer network (cell space) via a mutual effect with the machine collective.

--"Redundancy-adaptation" is characteristic of man-man communication; that is, in the course of communication the redundancy of messages constantly adapts to the communication processes. (People understand one another even with "half words.") the YKWIM concept ("you know what I mean") has already appeared in modern computer science, in research on artificial intelligence. We want to proceed in this direction in the development of the MIND system.

--In computer science the originally inseparable triple semiotic unity of syntax-sematics-pragmatics long developed in a distorted way as a result of the complete neglect of pragmatics. As a result of the work of J. Bar Hillel, R. Montague and R. Kowalski, however, pragmatics began in recent years to receive its proper place in the computer technology semiotic relationships system. Pragmatics means that we can also formalize that interpretation structure by virtue of which man interprets the significance of signs. Using the expression of Quine, this interpretative activity is "enthuematic" (that is, it takes place by means of the accumulation of implicit conjectures with extraordinarily many nonformalized detours and transpositions). In computer science, little thought has been given to the formalization of enthumematics although, in 1950-1952, R. Carnap laid the conceptual foundations by starting the theory of explication (and Robinson, Wang and Kowalski, among others, developed the technical tools). (For comparison, see mechanical theorem proof or the PROLOG language.) As far as we know formal program correctness tests at the assembler level are still rare. But they play a priority role in the development of the MIND.

The L Processor

Tamas Legendi is chief of the cell-processor research taking place in the Automat Theory Research Group of the MTA. His publications are well known and cited here at home and abroad. We should mention his proposed cell-processor architecture which he calls the L processor. The new concepts introduced by him are spreading--such things as cell processor, cell algorithm, cell program and cell microprogram--and what is more important the work of those in Szeged is giving concrete technical content to these concepts. In 1978 he received the MTA prize for basic research.

The successes of the research group are proven by, among other things, the results of the basic research done within the framework of a several-year contract with the SZKI [Computer Technology Coordination Institute], the long-range research cooperation established with the Scientific Academy of the GDR and the results of the joint project conducted with the Braunschweig Technical University on the basis of an MTA-DFG [German Research Association] interstate agreement.

The cell-processor school developing in Szeged has made possible or provided a framework for more than 50 diploma theses; they have written several prizewinning OTDK theses, university doctoral theses and monographs.

In regard to scientific organizational activity we should mention his creation and leadershpp of the Parallel Computing Group of the NJSZT [Janos Neumann Society of Computer Technology] and the preparation and conduct of NJAZT conferences and its congress. Tamas Legendi was invited to be a member of the program committee of the CONPAR 81 parallel programming and problems conference (Nurenberg, 1981) and to participate as a speaker.

The goal of the Szeged cell-processor project is to design, create, program and put into use universal and special purpose cell processors, which constitute parts of computer systems, which are faster and more powerful by several orders of magnitude than traditional computers (have greater computing power with the same quantity of hardware).

The theoretical background for this work is the traditional cell-automat theory which was laid down by Janos Neumann and significantly further developed by A. Burks and Codd. Several hundred works on achievements in this area appeared in the 1970's. (From 1972 to 1974, Guyla Fay and his group were the pioneers in Hungary.)

In the course of the development of computer technology the single-processor, centtralized, sequentially controlled computer long reigned alone because of the greatly restricted machine size resulting from technological limiting conditions. Because of increasing demands, the speed limitations and organizational problems of these increasingly became obstacles to further development. With the appearance of LSI technology, the path was open for substantially larger system dimensions. A study of various parallel architectures became a realistic research and development trend and we began to see research results and models for vector computers, multiprocessor computers, associative processors and Dataflow processors, and even some operating devices.

Compared to this, cell-processor research lagged behind because even with the increased system dimensions the theoretical achievements did not make directly possible the creation of "cell-automat computers" (this would still require a machine size greater by several orders of magnitude) and the programming of effective cell processors for practical purposes remained a completely unsolved, open question.

In order to solve these problems, those in the Szeged cell-processor project developed a cell-processor architecture family containing cell fields consisting of many small microcells which make the creation of cell fields of several tens of thousands a routine task and the creation of cell fields of a hundred thousand a task which can be solved realistically with existing (8080 level) technology.

The Szeged cell-processor researchers developed a cell-programing methodology and prepared and ran, in their large-scale simulation systems, cell algorithms on the order of one hundred.

These cell algorithms are very efficient--they require a minimum number of cells, and the great majority of the microcells are in continual useful operation. The majority of the cell algorithms are bit-parallel, thus execution time is independent of work length and the cycle time is the execution time of the bit-level operation.

A unit which carries out the number and size of operations needed for the task can be loaded into the chief operation executing unit of the cell processor, the cell field, thus the software configuaation ensures the flexible adaptation of the computing system to the computation to be carried out. All this together results in the efficiency and speed.

The average user will use the cell processor indirectly via new system macros or via the services of an operating system and language system based on these. Suitable host software in the computer controlling the cell processor ensures storage of the new system macros and their execution in the cell processor.

The obvious advantages of the homogeneity of manufacturing technology circuits which repeat even on one chip, design which is cheaper and faster by one order of magnitude hundreds or even thousands of identical units in one piece of equipment) and the change in architecture which can be expected with the appearance of electronic background storage (realistic system balance will require high-speed processors capable of processing a large data flow) both support the justification and viability of cell processors.

The achievements unfolding in related areas (parallel computing systems, parallel algorithms, interactive blocks, gate blocks, circuits especially designed for users, FPLA's, PROM-based logics and the design requirements of VLSI development) also indicate that cell-processor research is beginning to become part of the main trend.

On the basis of the results achieved in the Azeged cell-processor project, Tamas Legendi definitely asserts that "the creation of cell processors has become possible within a short time (2-3 years) and their realization is only a question of leadership, financing and parts technology."

Legendi:

In order to characterize our work thus far, I would like to say that this is a complex research project or proposal leading up to introduction in industrial development, one with very concrete partial achievements. This project can be realized in Hungary in the near future with existing technology. We are striving to serve primarily not what is most interesting but rather what will be mass applications needs within a foreseeable time.

By complex, I mean that the project consists of a number of parts which are different even in character. It is a sort of fulfillment of the criteria and requirements demanded by Tibor Vamos that we carried out a certain clarification of the theoretical foundations. Nevertheless a cell processor does not yet exist (although cell-automat theory is the best developed part of parallel theory) simply because there is a very large gap between theory and the machines which can be made. We had to bridge this gap by developing (a little) the mathematics of finite and inhomogeneous spaces in place of infinite homogeneous spaces. Then we could make design proposals. On these theoretical foundations, we did a great deal of work to develop special simulation languages and processors. On the basis of these, we ran a large number of cell algorithms (on the order of one hundred), cell programs which became increasingly complex also still a limited and rather small applicable cell-program packages have been run. The most noteworthy achievement by international comparison may be that we already have such a quantity of cell algorithms or cell programs. I know of no similar achievements in the "open" literature. I have also proposed a very concrete cell-processor architecture. These algorithms or programs can be run on the proposed architecture. I have also planned how this cell processor should be integrated in a natural way in the architecture of customary computers, hardware and software, without the user having to learn any new cell languages--one could not count on this in the near future anyway. Our articles, appearing in about two dozen domestic and foreign forums, report on this architecture. I would like to note that the most essential part of the cell processors is the cell field. This cell field is made up of very small microprogrammable microcells. The fact that we chose this microcell approach was not simply a search for research beauty but rather it was a condition for the creation of cell spaces on an order of magnitude of 10,000 or 100,000. The experiments known to have been run thus far on the basis of traditional cell automat theory failed because they proposed cells containing microprocessors equivalent to about 1 unit and for practical applications one would have needed millions of these.

The proposed architecture ensures the creation of cell processors containing cell fields on the order of 10,000 or 100,000. We have created very efficient programming methodologies and concrete cell programs for these. I even dare to make the more pointed statement that within a foreseeable time it will be possible to create systems containing a large number of cells which consist of two-dimensianal cells of very small size, no longer than about 20 to 100 gates. Within the project we have already started long-range applications research too; since 1978 we have prepared five studies for the SZKI and I feel that we have received very effective guidance and feedback so that we are preparing applications studies for really definite practical problems. We have prepared data-processing, process-control and picture-processing studies with cell programs which have been run in detail.

We already see the posiibility of realizing in our homeland a special-purpose computer for which there is a mass applications demand. This would be a sorting machine for which the KFKI [Central Physics Research Institute] will manufacture the sorting chip with technology at the INTEL 8080 level. They have prepared the masks and the first test chip, which contains one cell.

Preparation of the 128-bit full chip will take about 1 1/2 years. We have finished plans on how to put together a complete sorting computer from this (64 chips mean a sorting capacity of 1 kbit). A processing speed independent of record length is characteristic of cell-organization bit-parallel processing ability so it could sort byte or 2-byte words or 100-byte records at a rate of 5 Mrecords per second. This speed is too great for traditional computers today; they can handle only a smaller data flow. This means that our architecture will become truly efficient if in the course of the 1980's there is a spread of the use of higher speed background stores.

Our cell-processor model was prepared from traditional circutts. In this one can see 16 cells on one printed card and each cell consists of two traditional units. Going beyond functional simulation, we did this in order to get real hardware experience prior to construction of real cell processors. Since only the appearance of LSI (or VLSI) technology will create real possibilities for us (and development of this is still under way in Hungary) we are trying, until this appears, to design special processors with a cell-like organization using traditional parts which can be obtained commercially. We would like to mention one of the results achieved thus far, the picture-processing processor being prepared for a client in the GDR which does prefiltering and picture preprocessing.

Finally let me emphasize that from the viewpoint of the realizability of our plans the domestic appearance of LSI and VLSI technology is a key question.

So the big question is finally what can we realize here at home. In America, 9 months after his proposal, Professor Kung had a VLSI chip in his hand. It is true that "brute force" recommended weaker algorithms and cells--but they did it. We have an entirely new proposal, not heard of before, for bridging over this problem. There is a good chance that we could make VLSI's in the Hungarian style (by which I mean more precisely that there is no reason we could not) by using only existing technology. In this case, it seems possible to put several thousand microsize cells in one unit by the end of 1983. (To be continued)

8984
CSO: 2502/89

CRISIS IN SCIENTIFIC FIELD DESCRIBED

Olsztyn GAZETA OLSZTYNSKA in Polish 26-28 Jun 81 pp 1, 4

[Interview with Professors Wlodzimierz Baran, Zdzislaw Larski, and Stanislaw Szteyn by Czeslaw Wronkowski: "On the Status of Polish Science"]

[Text] In times of lively discussion of various topics, the role of science can in no way be ignored. As is known, science has not been standing apart, but has markedly influenced individual areas of the functioning of society. Its influence may not always have been positive, and in many cases it has actually been negative, but its creative nature must be perceived. It may be that it was not science itself but its representatives who caused harm to our economy. Thinking men are amazed by the large number of mistaken dicisions adopted on the basis of scientific and costly expertise acquired by scientists. It is hard to believe that such large numbers of educated people--and especially the highly trained people such as the scientific workers of higher schools and research institutions no doubt are--did not include brave enough or wise enough persons to warn the decisionmakers in time against mistaken decisions. Or perhaps their scientific awareness was so low as to prevent them from preceiving the consequences of their expertise? Or perhaps our [Polish] science is a pseudo-science and scientists are simply people who in most cases practice their hobbies at the state's expense?

What then is the state of Polish science compared with world science? What are the causes of the crisis of Polish science? What assures a scientist's success in research? I posed these and several other questions to eight professors at Olsztyn institutions of higher education. It is a pity that only three found the time to send me their answers to the above questions. These three are, however, individuals with undoubted scientific contributions and prestige, so that their comments can be approached with confidence and attention.

The professors who were kind enough to answer the above questions were: Wlodzimierz Baran (ART [Agricultural Technical Academy]), Zdzislaw Larski [ART, and Stanislaw Szteyn [WSP [Higher Pedagogical School]).

[Question: How do you assess the state of Polish science compared with world science? [The written responses follow:]

W. Baran: Such an assessment cannot be unambiguous. There are areas in which Polish science stands at the highest level in the world. Consider, e.g. the basic research into stellar evolution by Polish astrophysicists. On the other hand, there are areas which never had--or had lost long ago--contact with world science and in which the distance separating them from the level of world science is growing instead of decreasing. This concerns chiefly all those domains in which advances are impossible without well-equipped laboratories and without research equipment. The lack of up-to-date equipment literally is paralyzing the development of the researchers based on the scientific experiment.

In satellite goedesy, e.g. unless observatories are equipped with latest-generation doppler receivers or laser rangefinders, it is not possibel to be an equal partner of the laboratories equipped with these facilities and thus to adopt their research programs. Obsolete equipment can be used only to solve problems marginal to a given discipline, most often those which the "haves" despise or disregard in their hurry to get on with more important research.

Z. Larski: This state is assessed as extremely low, even when compared with the state of science in the other CEMA countries.

S. Szteyn: The state of Polish science compared with world science is decidedly unsatisfactory. Only a few fields, such as certain branches of the natural sciences as well as of mathematics, physics, or archeology, are producing results that count on the world scale. The Polish engineering sciences decidedly lag behind the advances of world science.

Question: What are the causes of the crisis of Polish science?

W. Baran: The crisis which has affected all domains of our life, was also bound to affect science, which is one of the elements of the nation's socio-economic system. True, the consequences of this crisis, which began in the second half of the 1970's, were not as detrimental to the development of science as to that of various other branches of the national economy, but nevertheless it threatens the development of many scientific disciplines. A major cause of the crisis of our science is, in addition to the aforementioned lack of up-to-date equipment, in my opinion, the excessive bureaucratization of many organizational structures of Polish science.

A grave mistake, correction of which is being attempted at present, was the upsetting of the equilibrium between basic and applied research. Priority was given to the latter type, but nevertheless little was done to introduce the results of that research into production. Another cause of the crisis was the establishment of all kinds of research centers which resulted in the dispersal of effort and resources. Yet another and highly important cause of the difficulties being experienced by science at present has been, in my opinion, the moral crisis of the scientific community. A manifistation of that crisis is the disappearance of scientific criticism, the absence of objectivity in the assessment of research work, and also the not infrequently observed pursuit of "easy money."

Z. Larski: The principal cause of the crisis is seen in the fact that nonscientific considerations have influenced scientific progress ever since the founding of the Polish People's Republic. This resulted in giving preference to pseudo-social scientists and in effect often to pseudo-scientists as well. Such a situation has resulted in a situation in which, apart from a few exceptions, the leading positions --including membership in the Polish Academy of Scinnces--were occupied by mediocrities. This in turn discouraged the others, including extremely talented persons, from getting ahead. What happened was negative selection.

Moreover, during the period of the drastic increase in student enrollment and concommitant decrease in quality of education, the recommendations for appointments to professorial posts often reflected not so much the suitability of the nominees as the need to adjust upward the number of professors to correspond with the rise in enrollment. This rapid quantitative increase, in its turn, served as the basis for granting to departmental councils the right to reduce the prerequisites for the satisfaction of degree requirements.

S. Szteyn: There are many causes of the crisis of Polish science. A major role here is played by economic considerations--the lack of funds for modern equipment, the problems with reagents, the limited contacts with world science, and recently even problems with the acquisition of foreign scientific periodicals. The initiation of truly innovatory scientific research always entails considerable financial risk. Given the current financial structure of [Polish] science (key problems, interministerial problems, etc.), scientists work on problems with regard to which they can be certain of performing their research on schedule. Thus there is nothing surprising in the fact that they deal chiefly with so-called "sure" topics, regarding which the risk is minimal. Definitely, too little attention is paid to--and hence also insufficient resources are allocated for--basic research and so-called noncontractual research. Scientists in this country are condemned to using equipment developed in other countries. It is only in those countries that true scientific progress is achieved, whereas we are condemned to a more or less modified duplication of that equipment. To put it in a nutshell, there can be no science without funds, and sizable funds at that. This is best evidenced by the share of scientists from various countries in the distribution of Nobel prizes. This is how I account for the fact that not a single Polish scientist--except for Maria Curie-Sklodowska, who had worked in France--has ever been awarded the Nobel prize in fields requiring substantial financial outlays such as medicine, natural sciences, physics, etc.

Question: How do you account for your scientific accomplishments?

W. Baran: My feeling is that what counts most for any scientist is human relations, in addition to the laboratory and research equipment. I was fortunate to be the member of a team in which an atmosphere of mutual goodwill always reigned, mobilizing all members of the team for work. It also mobilized me for work.

Z. Larski: In connection with what I stated before, persons lacking nonscientific patronage could achieve scientific accomplishments only by working so intensely that their families and health suffered. A major factor doubtless was talent, and sometimes luck as well; for example, the awarding of a stipend for study abroad which facilitates the discovery of talent and research opportunities.

Professor Szteyn did not answer this question.

Question: In your opinion, what predispositions are desirable for a young scinetist wishing to pursue a career in science? What personal traits assure his advancement in science?

W. Baran: To me, the principal desirable traits of young scientists are:

--industriousness and high self-discipline;

--passion for scientific truth;

--modesty and ability at intercourse with others.

Z. Larski: The young scientist should display: excellent memory, ability to analyze the observed effects and to classify and synthesize the observed facts; industriousness; strength of spirit, especially ability to withstand inevitable failures in scientific work; and knowledge of at least two foreign languages. These aspects are extensively discussed by H. Selye in his book, "Old Marzenia do Odkrycia Naukowego" ["From Dream to Scientific Discovery."]

S. Szteyn: What I prize most in young scientists is the spirit of independence which enables them to stop rigidly depending on the "master" in everything. I always regard my assistants as future independent scientists who must not only preserve, but also develop and refine, the knowledge inculcated by the instructor. Only scientists with these traits have the potential for making genuine scientific discoveries and advancing the state of knowledge. In Poland young scientists must be prepared to overcome many difficulties arising from our economic situation--difficulties that are alien to their foreign colleagues. They must also face the possibility that even if their scientific accomplishments are substantial, the resulting financial compensation will not be adequate to the effort invested.

Question: In your opinion, how can Polish science find a way out of this difficult situation?

W. Baran: The prime prerequisite for overcoming the crisis situation for science is the introduction of a far-reaching economic reform. In the meantime, everything must be done to avoid losing contact with world science. Halting the influx of professional literature from the Western countries could cause irreparable harm to Polish science. Attempts to end this influx have been undertaken recently.

One way of solving the crisis of Polish science should be to tighten the criteria for the employment and promotion of scientists. They should satisfy much higher requirements as regards training and moral attitude. The proper importance of scientific degrees and titles should be restored.

Z. Larski: Despite the nation's difficult situation, outlays [on science] should be sharply increased, overcoming the absurd conviction that science is a nonproductive branch of the national economy. In addition, it is necessary to drastically curtail university enrollment in many domains in which the economy's demand for specialists has been not only saturated but exceeded. This will enable scientists to devote themselves to research important to the economy.

Further, a reduction in the numbers of university students, many of whom are by now potential jobless university graduates, will slow down the rate of appointments to professorial posts. One way of solving the crisis of our science is to disband the bureaucratic institute structure imposed after 1968. This structure has in no way benefited science, and is heavily weighted in favor of the administration. For example, in our Department of Veterinary Medicine 12 out of 16 independent scientific workers occupy administrative positions: 1 dean, 2 deputy deans, 3 directors, and 6 vice directors. Also improperly termed cooperation between higher educational institutions and the national economy needs to be revised and altered.

S. Szteyn: I do not foresee any rapid solution of the crisis of Polish science. As this nation's economic situation improves, increasingly greater funds should be allotted to science. Contact with world scinnces should be also made possible quite rapidly--and that not only through unrestricted access to world literature but also through personal contacts. In addition, scientists should be given a free hand in the selection of research topics, and the occasional lack of results should be regarded as a natural risk of scientific research. Further, Polish science should be debureaucratized.

Also, the "manipulation" of scientific degrees and titles should be eliminated. This should restore appropriate rank to scientists in this country. Hence the crisis of Polish science should be solved not only on the material, but also on the moral plane.

Questioner: Thank you for your comments, some of which are extremely critical, but honest. This is what our readers expect from men of science.

1386
CSO: 2602/17

BRIEFS

NEW MINICOMPUTER--A new type of computer of the "M-118" family has been produced by the Enterprise for Electronic Computers in Bucharest, according to designs of Romanian specialists. Presented recently at the Leipzig International Fair, the Romanian minicomputer, the "M-118-GS," was highly evaluated by specialists and was awarded the Fair Gold Medal by the organizers. From the technological point of view, the "M-118-GS" minicomputer is far superior to other products of this type manufactured in Romania or abroad. The system includes new equipment, with a device for the graphic and alphanumeric display of data on a television screen, which ensures a perfect presentation of the results of the computations both in numerical form and in the form of graphs and tables. Its performances rank it among the minicomputers with average to large capacity and it has numerous useful programs in fields such as: scientific research and engineering technology, in design, education and administration. Its functional and construction characteristics allow customers to install it and utilize it with facility under any conditions. [Text] [Bucharest SCINTEIA TINERETULUI in Romanian 10 Jul 81 p 1]

CSO: 2702/26

END

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4 September 1981

East Europe Report

SCIENTIFIC AFFAIRS

No. 713

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EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 713

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RYAD-32 COMPUTER HARDWARE, SOFTWARE CONFIGURATIONS DESCRIBED

Warsaw WIADOMOSCI TELEKOMUNIKACYJNE in Polish No 4, Apr 81 pp 110-116

[Article by Eng Waclaw Piwonski: "The EC-2032 (R-32) Electronic Digital Computer"]

[Text] This article is about the most popular uniform system [JS] computer in Poland today: the EC-2032 (R-32). It is manufactured at the MERA-ELWRO plants in Wroclaw within the framework of Poland's specialization among the CEMA countries. A typical configuration for this computer is shown in Figure 1. It consists of a central processing unit [CPU] having an operating memory of 512 kilobytes [kB] (1,024 kB maximum), an eight-unit disc memory with a 30 megabyte [MB] capacity, a six-unit PT-3 tape memory (the disc and tape memories are connected to the processor by means of a control unit), two EC-7033 high-speed printers, two EC-6016 card readers, and a operator's console (this can be a EC-7076 character-mosaic printer or a EC-7910 CRT display unit).

In addition to strictly technical data, this article presents certain information concerning the structure of the operating system which will be useful in evaluating computer capabilities.

The EC-2032 digital computer (popularly known as the RYAD-32 or R-32) is one of the basic JS computers. It is considered to be either a medium-class or large-class computer depending on memory capacity and configuration of peripheral equipment. It is designed to solve extensive and complex problems in the areas of electronic data processing and scientific-engineering calculations. The EC-2032 CPU consists of three basic components: a processor, channels and an operating memory. The processor controls the processing process in accordance with a given program. The processor is connected to peripheral equipment via input-output [I/O] channels, namely multiplexer channels and selector channels. A multiplexer channel permits a number of I/O devices to be connected, most frequently slow- and medium-speed data-transmission equipment such a perforated-card equipment, printers and the like. A multiplexer channel contains 256 individual subchannels or 120 undivided and 8 divided subchannels. Only one I/O device can be connected to an undivided subchannel, but up to 16 I/O devices can be connected to a divided subchannel. In the multiplexer mode, data-transmission speed is 145 kB/s; in the selector mode it is 470 kB/s. A selector channel permits high-speed peripheral devices (external disc and tape memories and the like) to be connected to the processor. Up to 8 control units can be connected to a single selector channel, which in turn can control up to 256 I/O devices. The total capacity of the

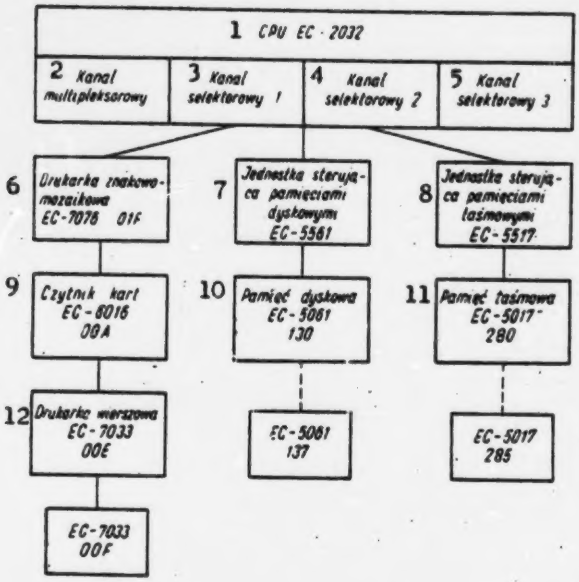

1 CPU EC-2032
2 Kanal multipleksorowy
3 Kanal selektorowy 1
4 Kanal selektorowy 2
5 Kanal selektorowy 3
6 Drukarka znakowo-mozaikowa EC-7076 01F
7 Jednostka sterująca pamięciami dyskowymi EC-5561
8 Jednostka sterująca pamięciami taśmowymi EC-5517
9 Czytnik kart EC-6016 00A
10 Pamięć dyskowa EC-5061 130
11 Pamięć taśmowa EC-5017 280
12 Drukarka wierszowa EC-7033 00E
EC-5061 137
EC-5017 285
EC-7033 00F

Figure 1. A typical EC-2032 (R-32) configuration

Key:

1. EC-2032 central processing unit
2. Multiplexer channel
3. Selector channel 1
4. Selector channel 2
5. Selector channel 3
6. EC-7076 01F character-mosaic printer
7. EC-5561 memory disc control unit
8. EC-5517 memory tape control unit
9. EC-6016 00A card reader
10. EC-5061 130 disc memory
11. EC-5017 280 tape memory
12. EC-7033 00E line printer

selector channels is 2.5 MB/s. The operating memory stores instructions as well as processed data. It consists of 4,096-byte (4 kB) memory modules. Memory capacity can be 128 kB to 1,024 kB, based on individual memory modules having 128 kB capacities. A byte (8 bits + 1 control bit) is the smallest unit of information that can be addressed in the operating memory. Bytes within a memory module can be addressed directly. Memory locations are addressed by a 24-bit number starting with 0.

Technical Data

The EC-2032 CPU

Length of computer word--32 bits;
Computer basic cycle--300 nanoseconds [ns];
Control--microprogram;

Execution times for basic arithmetic operation--2.4 to 16.4 ns;
Average speed (according to the Gibson 1 mix)--220,000 operations per second;
Number of control units--up to 8;
Data transmission speeds:
  Multiplexer moder--145 kB per second,
  Selector mode--470 kB per second;
Memory for control words--4 kB (portion of operating memory programically inaccessible);
Selector channels:
  Number--3,
  Number of subchannels in each channel--256,
  Number of control units per channel--up to 8;
Operating memory:
  Capacity--128 to 1,024 kB,
  Each additional memory module--128 kB,
  Cycle (for one word)--1.2 microseconds [us],
  Access time--0.5 us,
  Word length--36 bits including 4 control bits,
  Memory protection--while recording as well as while recording and reading;
Input power--380/220 VAC, +10 percent, -15 percent; 50 Hz, ±2 percent;
Power consumption:
  With a 256 kB CPU--3.8 kilovolt amperes [kVA],
  With an additional 256 kB--2.0 kVA;
Permissable operating temperature--5°C to 40°C;
Recommended operating temperature--20°C to 24°C;
Permissable humidity--40 percent to 60 percent;
Weight:
  256 kB CPU--430 kg,
  Additional 256 kB module--250 kg.

The EC-7033 Line Printer

The EC 7033 line printer is a device designed to retrieve quickly information from JS computers in the form of texts or tables. It is a buffered-drum printer based on transistor-transistor logic [TTL] integrated circuits.

The printer operates with the CPU in accordance with the principles defined by the JS interface standard. The printer stores data transmitted from the CPU via a multiplexer channel in a one-line-capacity memory. After the memory is filled up, its contents are printed; this in turn permits the next portion of information to be received.

The printing of characters is based on "in-flight" printing; electronically excited hammers strike through paper and dyed tape the printer drum spinning at a constant speed. Printing speed can change, depending on the printer's mode of operation. If single spacing between lines is maintained, the printing speeds are:

  100 lines/min for fast operation--1100,
  50 lines/min for slow operation--550.

One or more printers can operate in a JS digital computer configuration.

The EC-5017 Tape Memory Unit

A tape memory is used to store information in the form of data or programs. The amount of information that can be stored is practically unlimited, depending only on the amount of magnetic tape possessed. The use of a one-roll tape-drive system from the base side assures long tape life or capacity to be used repeatedly for information record and readout operations. From the magnetic carrier side, the tape touches the heads only during information record and readout times, but it does not touch during rapid rewind. The magnetic-heads assembly consists of nine double-gap read-write heads and an erasing head. The entire equipment mechanism is mounted on a rotatable frame, permitting easy access to and replacement of specific assemblies.

Tape speed:
Record and readout--3 ms,
Rewind--5 ms;
Record density--8, 16, 32 bits/mm;
Record type--NRZ 1;
Number of tracks--9;
Interblock gap--15.2 mm;
Maximum transmission rate--128,000 characters per second;
Magnetic head--universal record and read-out in accordance with ISO [International Organization for Standardization] standards;
Tape parameters:
Maximum length--750 m,
Width--12.7 mm;
Spool outer diameter--267 mm;
Power consumption--1.0 kVA;
Weight--359 kg.

The EC-5061 Disc Memory Unit

Disc memory units are the primary means of storing so-called mass information. Up to eight units can be connected to one EC-5561 control unit.

The capacity of a single replaceable disc packet is 30 MB. Each packet contains 20 working surfaces and 20 heads. Each disc surface contains 200 tracks plus three reserve tracks. The disc revolves at 2,400 rev/m ± 2 percent. Average access time is 60 ms.

The EC-6016 Card Reader

Information carrier--80- or 90-column card;
Maximum read-in speed--60,000 cards per minute;
Card code--KPK or binary;
Magazine capacity:
Card feed--2,000 cards,
Card stacker--2,400 cards;
Photoelectric read;
Mechanical blade feed, start-stop operation.

The EC-7076 Character-Mosaic Printer

Printing rate--up to 180 characters per second;
Type of print--mosaic (7X7 matrix);
Number of characters--up to 96;
Line width--132 characters;
Keyboard character set:
    Letters of the Latin and Cyrillic alphabets,
    Digits,
    Punctuation and control characters;
Power consumption--250 VA;
Recommended temperature of environment--20°C to 24°C;
Weight--25 kg.

The character-mosaic printer is used as an operator's console in the EC-2032 system.

The EC-7910 Cathode Ray Tube [CRT] Monitor

Rate of transmission--up to 2,400 bits per second;
Maximum monitor capacity--1,920 characters (24 lines X 80 characters per line);
Keyboard--alphanumeric and digital.

System Software

The operating system is one of the primary elements of a modern computer system. Its output and proper operation determine a system's efficiency as much as the quality and technical parameters of its hardware. Therefore it is not surprising that as more complex computer systems are placed into operation, interest increases in their theoretical and practical efficiencies as well as in methods of measuring them.

A operating system is a set of programs (operating under the supervision of a central program) which controls the input of data into operating memory, the operation of I/O devices, the translation of programs, the assignment of memory and the management of data. It also controls the proper operation of the computer and accounts for the system's operation. The extent of the operating system is attested to by the fact that it would require 6 million cards to record it on perforated cards.

When operating an IBM or JS computer, two types of operating systems are used: the Disc Operating System [DOS] and the Operating System [OS]. This article in particular describes the OS, the most universal and popular system. Its advantages are:

--It is easily adaptable to a hardware configuration;
--it is capable of organizing various ways of processing;
--it is equipped with extensive auxiliary software and efficient translators for the most popular programming languages.

The SMF [System Management Facility] is an OS option that is added to the OS at the system-generation stage. The SMF consists of a set of programs whose purpose is to collect and store information on system activity concerning:

--session start and finish;
--allocation of and access to files on external carriers;
--the parameters of the executed job (start and finish times, number of consignments, amount of memory employed, and the like);
--TSO session start and finish;
--statistics on errors occurring on magnetic carriers.

This information is recorded on discs on the SYS1. MANY and SYS MANY system files in the form of defined types of records. To have a permanent record, they must be successively recorded in a file containing a complete set of records for a certain time period (in practice, on magnetic tape). Information collected this way can serve to present a system's operating data for a given time period. After the currently obligatory price list is fed into the system, the SMF system uses information it has gathered to print prepared invoices for individual clients that include the cost of all services performed during the last month or quarter.

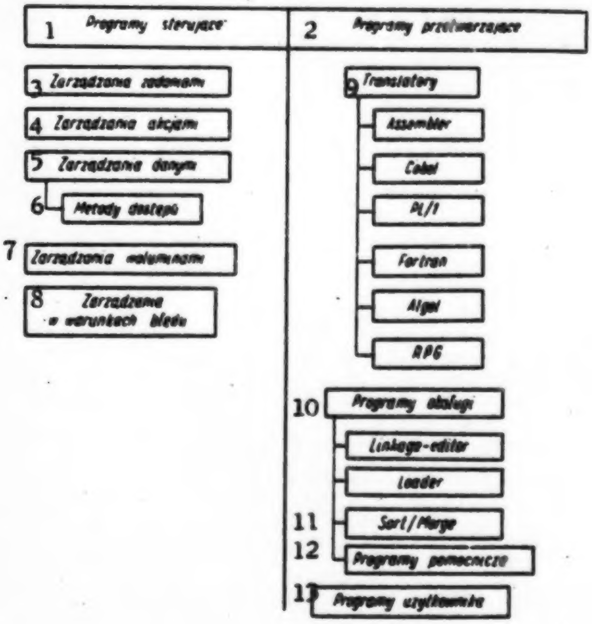

1 Programy sterujace
2 Programy przetwarzajace
3 Zarzadzanie zadaniami
4 Zarzadzanie akcjami
5 Zarzadzanie danymi
6 Metody dostepu
7 Zarzadzanie wolumenami
8 Zarzadzanie w warunkach bledu
9 Translatory
Assembler
Cobol
PL/1
Fortran
Algol
RPG
10 Programy obslugi
Linkage-editor
Loader
11 Sort/Merge
12 Programy pomocnicze
13 Programy uzytkownika

Figure 2. The OS/JS operating system

Key:

1. Control programs
2. Processing programs
3. Task management
4. Operation management
5. Data management
6. Access methods
7. Volume management
8. Recovery management
9. Translators
10. Service programs
11. SORT-MERGE
12. Auxiliary programs
13. Utility programs

The OS consists of two groups of programs: control programs and processing programs (see Figure 2). A control program can operate with a fixed number of tasks (multiprogramming with a fixed number of tasks [MFT]) or with a variable number of tasks (multiprogramming with a variable number of tasks [MVT]). Independently, one can opt for the so-called division operation (TSO) or remote-access operation (RJE, CRJE).

The MVT version of the OS/JS operating system permits one or several streams of input jobs to be processed. Up to 15 jobs can be processed at one time. Each one of the jobs can initiate tasks which are executed simultaneously with tasks created by the system and the operator. The number of simultaneously executed tasks on the MVT system is limited only by the amount of currently available resources. In addition to an area reserved for control programs, the operating memory contains an additional area (LPA--link pack area) for resident modules where the access method modules are located. The remaining area of memory is the so-called memory pool. Control programs assign subpool (called a region) from this pool for each initiated step. After the step is completed, the area of the region is returned to the pool.

Control Programs

Control programs consist of the following programs:

--job management;
--task management;
--data management;
--volume management;
--recovery management.

Job Management

In the OS system, a job is a specific problem that is solved using one or many programs. Job-management programs control and supervise the stream of jobs through the system, assuring the most efficient use of the system's resources. The basic tasks of these programs are to:

--introduce and analyze the stream of inputs: read and interpret the control sentences, create a structure representing the job;

--manage and supervise system resources: allocate I/O equipment, manage peripheral memories, check the possibility of access to volumes needed for processing;

--schedule operations: decide the starting order in which specific jobs will be executed by the system according to a specified principle (priorities or the first-in-first-out principle);

--permit communications between the operator and the system.

A user defines his requirements regarding the program and data files necessary to process his job via the sentences of the job control language.

The basic tasks of this language are:

--the JOB task designates the job beginning, contains information concerning the job (class of input, instruction number, required operating memory, maximum processing time, priority and the like);

--the EXEC task designates the initial step of the job, specifies the program or procedure designated for execution, and supplies supplementary information (for example, execution time, conditions for disregarding a step, parameters and the like);

--the DATA DEFINITION [DD] task serves to record data files, identify files, specify equipment and volumes containing files, list file attributes, and list much other information permitting the use of various options offered by the system.

Activities associated with introducing the input stream, outputing data and scheduling the execution of jobs are executed by a group of programs known as the Job Scheduler.

The Reader/Interpreter program reads into the system the job definition provided by the user using job-control-language sentences, verifies the formal correctness of these sentences, creates appropriate control tables and then locates a job in the appropriate input queue in accordance with the parameters defining the input class of the JOB task.

Activities associated with the start and finish of jobs and their steps are executed by the Initiator/Terminator program. The primary tasks of this program are to select a job from the proper input queue, to allocate and release required resources, and to control the installation and removal of volumes.

During the course of processing jobs, input files which are usually assigned to slow devices such as a line punch, card perforator and so on, are temporarily recorded on external fast memory devices such as discs or drums, and after the jobs are finished they are placed on the output queues.

A specialized output service program--the System Output Writer--selects files from the output queues and records them on appropriate devices.

Thanks to the processing method used, during which the inputting of jobs, their execution and the outputting of their results are independent of one another and can be executed simultaneously, a significant increase in system productivity is achieved, that is, the number of jobs executed in a given time increases. The use of specific system components such as line printers, card readers and perforators and the like, also increases greatly.

Programs that are part of the job management programs group and are included in the so-called Master Scheduler attend to messages issued by the system and communications between the operator and the system.

The MVT control program permits the simultaneous execution of up to 15 jobs. The jobs are initiated by the Initiator/Terminator program in accordance with parameters specified by the operator. Each job is treated as a separate task and competes with other jobs for the system's resources based on execution priority.

Task Management

In the OS this task is the basic unit of the executed work. All jobs to be processed must be presented in the form of a series of tasks. After initiation, these tasks compete for the system's resources (such as the CPU, operating memory and so on, and the Task Management programs supervise and control demand for the resources. The primary functions of the Task Management programs are:

—service: analyze reasons for interruptions in order to specify appropriate supervisor action;

—task supervision and control: record the tasks in the system, their status and priorities and designate the order of their execution;

—operating memory management: record unoccupied and allocated memory areas and the assignment and release of memory areas;

—supervising operating memory contents, loading programs into memory, keeping records of loaded programs as well as their attributes;

—clock service: set and operate the clock according to the needs of programmers.

The creation of tasks is done by processing EXEC statements or executing ATTACH macroinstructions. At that moment, control modules are created which specify the task during the entire time of its execution. When the task is completed, control is transferred to the control program which removes the control modules from the system and releases allocated resources and data files.

To control a task effectively, the system offers the programmer a number of conveniences such as dynamic changes of task priorities, apportioning time among a designated group of tasks and the possibility of task resumption in case of an abnormal finish.

Data Management

With the OS a user can simply manipulate, in various and extensive ways, data files by using a group of specialized data-management programs.

These programs are responsible for transferring data between the peripheral devices and operating memory, for analyzing the correctness of this transmission, and also for many auxiliary operations.

A user creating a data file can select a file organization that is most appropriate for his application. The OS assists the files with regard to sequential, direct, index-sequential and zone organization.

When processing a data file, one of two file access techniques can be used. Using the queueing technique, the user is concerned only with the file's logical records.

Data-management programs either record a subsequent record or make it accessible in response to the use by the program of an appropriate macroinstruction. The user is relieved of many jobs associated with the organization of I/O operations such as buffer management, blocking and unblocking records for synchronizing I/O operations.

The use of the basic access technique permits a user to operate on the physical records (blocks). Then the user is obligated to verify the correctness of I/O operation completions, the synchronization of these operations, and the blocking and unblocking of records. Greater processing efficiency and flexibility can be achieved at the cost of greater programmer effort.

One of the most important advantages of using data-management programs is that it becomes possible to make the written programs independent of I/O devices. This can be achieved because the program communicates with data-transmission service programs via standard I/O macroinstructions. The use of a different I/O device simply causes the use of other data-management modules without having to make changes in the program itself.

In addition to the above basic tasks, data-management programs offer a programmer the possibility of making use of many other conveniences of which the most important are:

--the use of standard, nonstandard and user label files;

--the possibility of locating a file through the use of the system's catalog;

--the possibility of defining operating groups of data files;

--protecting files against destruction or uncontrolled access;

--the use of special stipulations such as end of file, end of volume, depletion of file space, I/O error and the like.

The realization of I/O operations is executed by access-method procedures and the I/O supervisor.

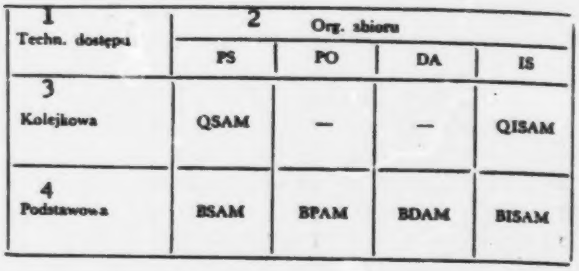
The procedures of the method of access to data files control the exchange of information between operating memory and I/O devices and assure proper organization of data files.

Method of access means combining the access technique with file organization.

There are four methods of access associated with file organization:

PS--sequential;
PO--library;
DA--direct;
IS--index-sequential.

Table 1.



1 Techn. dostępu	2 Org. zbioru			
	PS	PO	DA	IS
3 Kolejkowa	QSAM	—	—	QISAM
4 Podstawowa	BSAM	BPAM	BDAM	BISAM

Key:

1. Access technique
2. File organization
3. Queued
4. Basic

Volume Management

The possibility exists in the system of defining the status of a carrier; it is the statistical possibility of using a volume. There are two types of statistics: statistics of volume errors and analysis of volume errors.

Recovery Management

The operating efficiency of a computer system can decrease significantly if some of its components are not performing properly. To limit disturbances in the operation of the system resulting from such situations, the CS contains a group of programs which permit the repetition of operations after an error occurs, the recording of the conditions under which the disturbance occurred, and they also conduct an analysis and attempt to eliminate the error or to bypass it.

System Environment Recording [SER] programs record in the SYS1 system files-control unit and channel errors. The Machine Check Handler [LOGREC MCH] analyzes the conditions under which the errors occurred and attempts to resume the erroneously completed operations.

The Channel Check Handler [CCH] programs analyze channel errors and set up conditions to permit the repetition of unsuccessful operations.

The Alternate Path Reentry [APR] program permits the execution of repeat operations via another connection through the channel.

The Dynamic Device Reconfiguration [DDR] program executes volume transfer for which an I/O operation has been terminated because of the failure of other physical devices and renew attempts to execute the operation.

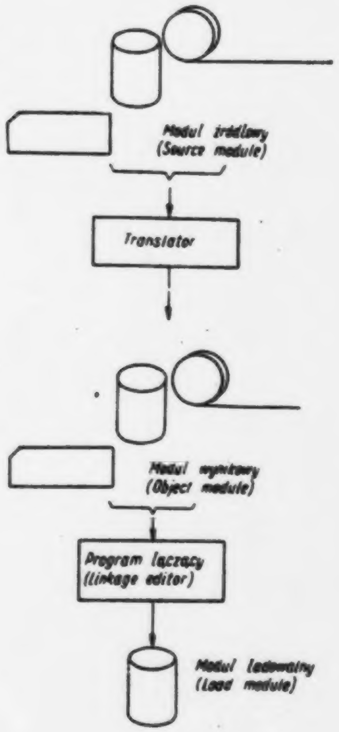
It also is possible to test I/O equipment, channels and control units for proper operation with the aid of the On-Line Test Executive Program [OLTEP], a collection of generating programs.

Processing Programs

Processing programs include translators and service programs.

Programming Language Translators in the OS/JS System

Translators transform source modules into object modules. While translating a source program, a translator checks for correct syntax and reports errors, their location in the program and the reason for the errors. Figure 3 shows a diagram for processing a source module.



Moduł źródłowy
(Source module)
Translator
Moduł wynikowy
(Object module)
Program łączący
(linkage editor)
Moduł ładowalny
(Load module)

Figure 3. Processing a source module in the OS/JS system

The ASSEMBLER

Catalog procedures:

ASMFC--compilation;
ASMFCL--compilation and linkage;
ASMFCG--compilation and execution;
ASMFCLG--compilation, linkage and execution.

COBOL

The complete COBOL ANS/COBOL language (American National Standard) version is used.

Catalog procedures:

COBUC--compilation;
COBUCL--compilation and linkage;
COBUCG--compilation and execution;
COBUCLG--compilation, linkage and execution;
COBULG--linkage and execution.

PL/1

Catalog procedures:

PL1DEC--compilation with output on cards;
PL1LFC--compilation;
PL1LFCL--compilation and linkage;
PL1LFCG--compilation and execution;
PL1LFCLG--compilation, linkage and execution;
PL1LFG--execution;
PL1LFLG--linkage and execution.

FORTRAN

Two FORTRAN IV language translators are used (levels G and H). These translators differ with regard to the amount of memory used and the speed at which source programs are translated.

FORTRAN G

Catalog procedures:

FORTGC--compilation;
FORTGCL--compilation and linkage;
FORTGCLD--compilation and execution;
FORTGCLG--compilation, linkage and execution;
FORTGLG--linkage and execution.

FORTRAN H

Catalog procedures:

FORTHC--compilation;
FORTHCL--compilation and linkage;
FORTHCLD--compilation and execution;
FORTHCLG--compilation, linkage and execution;
FORTHLG--linkage and execution.

ALGOL

The ALGOL translator realizes practically the complete ALGOL 60 standard version.

Catalog procedures:

ALGOFC--compilation;
ALGOFCL--compilation and linkage;
ALGOFCG--compilation and execution;
ALGOFCLG--compilation, linkage and execution.

RPG

Catalog procedures:

RPGEC--compilation;
RPGECLG--compilation, linkage and execution;
RPGELG--linkage and execution.

Service Programs

Service programs include:

--the linkage editor and a loader which prepare programs for execution in a system;

--the data file sort-merge program;

--auxiliary programs that perform many organizational functions and operations to transfer files from one carrier to another.

The Linkage Editor

This program links object modules created by a programming-language translator into a single program (a load module ready for execution).

Catalog procedures:

LKED--linkage;
LKEDG--linkage and execution.

The Loader

The loader links loader functions and procedures transferring a load module into operating memory. There are no catalog procedures for the loader.

SORT-MERGE

This program can execute sorting operations or link data files recorded on any I/O device which can operate from QSAM. Sorting can occur in accordance with 1 to 64 sorting keys. Linkage can be executed for 2 to 16 previously sorted files.

Catalog procedures:

SORT--with the possibility of linking the EXIT routine in the form of a object module or load module;

SORT--with the possibility of linking the EXIT routine in the form of a load module.

System Files

System files can be divided into two groups: files that include subprograms associated with translators and files associated with the realization of a specific OS function.

The first group includes:

SYS1. ALGLIB
SYS1. FORTLIB
SYS1. PL1LIB
SYS1. COBLIB

The second group includes:

SYSCTLG--this file includes information on all of the system's catalogued data files;

SYS1. SVCLIB--this file includes nonresident SVC procedures, access method procedures and standard system procedures for error operations;

SYS1. SYSJOBQE--this file is used as a working area by the tasks stream coordinator;

SYS1. LINKLIB--this file includes nonresident programs of the OS such as the ASSEMBLER and COBOL compilers, the linkage editor and some IEBCOPY, IEHLIST and IEBUPDTE auxiliary programs;

SYS1. PROCLIB--this file contains catalogued procedures;

SYS1. PARMLIB--this file includes system parameters used by the nucleus initiation program and by the main coordinating program;

SYS1. MACLIB--this file contains system macrodefinitions for the ASSEMBLER's macroinstructions;

SYS1. SORTLIB--this file contains load modules from which the system creates the SORT-MERGE program;

SYS1. MANX;

SYS1. MANY--these files contain information established by the procedures determining the statistics for system utilization;

SYS1. NUCLEUS--this file contains the resident part (nucleus) of the control program;

SYS1. SYSLOGX;

SYS1. SYSVLOGY--these files contain a chronicle of system operations containing, among other things:

--information submitted by the operator;
--task time, task step time and DD and EXEC sentence information;
--operator commands.

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GROWING USE OF NONCONVENTIONAL TECHNOLOGY SEEN IN INDUSTRY

Bucharest CONSTRUCTIA DE MASINI in Romanian No 4-5, Apr-May 81 pp 170-172

/Article by Dr Eng Ioan Roman of the Bucharest Technological Research Institute for Machine Building: "A New Stage in the Expansion of Nonconventional Technologies in the Industry of the Socialist Republic of Romania"/

/Text/ Our country's industrial development has necessitated alignment with the newest gains in technology on a world level, in order to be able to provide the proper quality and efficiency to the technological processes.

The implementation and expansion of nonconventional procedures of machining represent a significant example in this regard. Although their efficiency no longer has to be proved, the introduction into industry has been relatively slow, mainly due to the lack of our own manufacturing of equipment for these procedures and of a properly organized potential of conception.

For this reason, under the coordination of the ICCM /Central Institute for Metallurgical Research/, a coordinated program for a 5-year period, which proposed actions of a nature to reduce the gap that our industry had with regard to the industrialized countries, was drawn up in 1975.

Among the main objectives that the program also proposed, we mention the following:

The organization and specialization of research and design staffs for preparing for our own manufacturing of equipment;

The transition to the assimilation of families of equipment that would favor the implementation of nonconventional technologies in our industry;

The providing of centralized manufacturing of them by specializing an enterprise;

The concentration of all the forces that we have in departmental and higher-education institutes on carrying out the proposed program.

At present, we are in a position to draw up a balance sheet of the efficiency of the program carried out for a relatively short period and to draw the proper conclusions for the new, 1981-1985 program.

Thus, within the framework of the program, we will mention the main achievements, which are:

The achievement of research work that has laid the foundations for the designing of EDM [electrodischarge machining], ECM [electrochemical machining], USM [ultrasonic machining] and laser equipment;

The designing of families of EDM machines by the ICTCM [Technological Research Institute for Machine Building], the ICPE [Research and Design Institute for the Electrotechnical Industry], the IPA [Automation Design Institute] and the University of Brasov (the ELER-SD machine, the small ELER-11 machine, the medium ELER-01 machine, the big ELER-21 machine and the ELEROFIL-10 machine with peak performances, which are now being manufactured or in the process of assimilation for series production);

The designing and achievement of lasers, as well as machines of US 150 and 500 W, for the finishing of drawplates or other similar parts, by the ICTCM, the IFA [Institute of Atomic Physics] and the Iasi IF [Institute of Physics];

The designing and achievement of electrochemical deburring machines, as well as the ECM machine meant for the machining of molds for forges;

The providing of centralized manufacturing of EDM machines at Timisoara "Electrotimis" and Bucharest "Electrotehnica" for EDM generators and ECM sources;

The formation of specialized staffs capable of tackling at present any problem in the field of nonconventional machining.

After a number of preparatory research projects, which consisted of studying phenomena that appear in the processes for machining by means of nonconventional procedures, the designing of EDM, ECM, laser and USM machines was undertaken by specialized staffs, in accordance with a process corresponding to the assimilation of new products. Among them, greater attention was devoted to EDM technologies and equipment, as being the most necessary ones in the first stage of carrying out the program.

Thus, a family of EDM machines has been conceived, starting with the smallest one, the ELER-ED displaceable machine, designed and achieved by the University of Brasov, and ending with the ELEROFIL-10 machine, an electrodischarge machine with a wire with CNC [computerized numerical control].

At present, in this field, we can assert that the present family of general-purpose electrodischarge machines in five prototype dimensions, supplemented with the big machine with a wire and numerical control that is to be achieved, satisfies our industry's needs to a degree of over 95 percent.

In the field of electrochemistry, the technologies, that is, the equipment for deburring, greatly needed by the industry for hydropneumatic apparatus and the industry for automotive components and aviation, have had an exceptional spread.

Regarding three-dimensional electrochemical machining, it is less utilized by our industry, the phenomena that appear have been less thoroughly studied by researchers and, for this reason, it is insufficiently mastered, especially with regard to the precision of machining. The equipment made thus far, very productive as a matter of fact, provides precisions within the limits of 0.2-0.6 mm depending on the type of the machined part, which presupposes, in some cases, a final machining to a higher precision by means of another procedure, such as, for example, electrodischarge.

A number of laser and ultrasonic installations, utilized especially in the machining of diamond and metallic-carbide drawplates and in the making of openings of small dimensions for nozzles for various purposes, have also been researched and designed.

For all these things, standards, prospectuses and guiding materials have been drawn up and conferences and demonstrations for the specialists in plants and institutes have been organized, in order to know these procedures as well as possible and implement them in industry. The above-mentioned actions have had great effectiveness in spreading the nonconventional procedures of machining in the machine-building plants.

The production bases of the ICTCM and the ICPE, which achieved all the prototypes of the above-mentioned installations, as well as the manufacturing series for some equipment (such as the deburring machines), for which there is not yet a producer in industry, have had a big role in finalizing the work.

This method of approaching and finalizing the work has had as an effect a shortening of the assimilation cycles and a putting of the finishing touches on the construction and technological solutions, under conditions of high quality.

Under similar conditions, the ELER-SD machine has been achieved by the University of Brasov, with the utilization of the work being accomplished by means of series production of the machine by the shops of the same institution.

This represents an example of the way in which we want the work contained in the current program to be finalized by all the collaborators.

As a consequence of this action, in comparison with about 70 imported EDM machines (those that existed in 1977) in machine building, this figure now represents a single year's output of the "Electrotimis" Enterprise in Timisoara, which, as we mentioned, is mass-producing these machines.

It is also worth mentioning the fact that all this equipment is of our own devising, achieved with a supplementary importation of at most 5 percent of its value.

All these things have made a big contribution, direct or indirect, to the rise of the technical level of the technologies in our industry and, implicitly, to the growth of labor productivity, the reduction of the cost price, the improvement in quality and so on.

As minuses in the manner of carrying out the program, we can mention:

The still-long assimilation cycles for some of the equipment;

The elaboration of work without a strict orientation to the objectives pursued by means of the program;

The relatively low participation of the specialists in higher education in carrying out the program, especially in the phase of utilization (with the exception of the University of Brasov);

The insufficient utilization of some of the work done.

Nevertheless, it can be said that the program has succeeded, to a great extent, in achieving what it proposed and that the preparation of a similar one for the 1981-1985 period is essential.

Thus, as a result of fulfilling the main provisions of the program, the situation of of the nonconventional technologies in industry has changed considerably, a real basis for strong expansion of these technologies during the current 5-year period has been created.

Synthesizing, the situation is at present the following:

The percentage of the main nonconventional procedures of machining in the country is the following: about 70 percent for electrodischarge, 20 percent for electrochemical machining and deburring, 5 percent for laser, USM and electron beam, and 5 percent for other procedures;

While the equipment for nonconventional machining represented 0.12 percent of the total stock of machines for machining in 1975, it is judged that this percentage was 0.3 percent in 1980. At the same time, this percentage is 2-6 percent in the strongly industrialised countries, which, as one sees, still represents a big gap for our country;

In order to raise the percentage to about 2 percent, we would have to produce about 500 machines per year during the current 5-year period, which is practically impossible, but the attainment of the percentage of 0.8-1 percent at the end of the 1981-1985 5-year period is perfectly possible, both by increasing the research and design capacity and (especially) by increasing the volume of production of this equipment.

As one sees, the situation of the implementation of the technologies for machining by means of nonconventional procedures has improved considerably, in a relatively short time, but it cannot satisfy us, considering also the trends on a world level in this field.

In the strongly industrialized countries, there is intense concern for further increasing the percentage of the nonconventional procedures, as well as along the line of improving the equipment and technologies, as follows:

In the field of electrodischarge machining (EDM):

The achievement of special ED machines, for introducing them into the lines of series production;

The achievement of ED machining centers;

ED machining by means of generation;

Complex kinematic machining by increasing the number of movements of the tool and the part;

New procedures for machining by means of electrodischarge sparks (grinding, surface hardening and so on);

In the field of electrochemical machining (ECM):

The increasing of the precision of EC machining;

EC deburring of big burrs;

New electrochemical procedures (grinding, engraving, printing and so on);

In the field of laser machining (LBM):

The increasing of the energy of the radiation and the utilization of continuous lasers (utilization of YAG-Nd [yttrium aluminum garnet-neodymium] and so on);

The automation of auxiliary operations;

The improvement of laser optics;

The expansion of the utilization of laser installations (engraving, microcircuit printing, resistant adjustments, controlled fissuring of natural crystals and so on);

In the field of ultrasonic machining (USM):

The increasing of the useful power;

The achievement of special tools resistant to wear;

The expansion of the fields of application (complex machining).

The program that has been drawn up for the 1981-1985 period takes these trends into account, as well as the current possibilities and needs of our industry, and includes mainly the following:

The diversification of the general-purpose EDM machines with a massive electrode and with a wire;

The improvement of the EDM machines in series production, in order to maintain their competitiveness both functionally and (ca dispozitivare);

The achievement of specialized EDM machines (for big molds for tires, auto bodies and so on);

The improvement of EDM technologies;

The assimilation of special materials for electrodes in the country and the improvement of the technologies for achieving them;

The improvement of ECM equipment and technologies;

The improvement of laser and US equipment and technologies;

The starting of the work of assimilating the machines for electron-beam machining.

In view of the current conditions regarding the material base existing in the departmental institutes and those of higher education, the research and design force that we have, and the possibilities created by the centralized manufacturing of the equipment for machining by means of nonconventional procedures, it can be asserted that the program has a real basis and that it will be fully carried out.

It is financed mainly by the ICCM and keeps track of the achievement of both its own work and that financed and done by other institutions, in order to avoid duplication.

The experience gained thus far allows us to approach the work on a higher level and with a greater degree of certainty regarding finalization and utilization.

Regarding the equipment mentioned in the program, in addition to the proposed objectives, we intend to expand the typification both of the machines and of their component elements.

Through the way in which the tasks have been established, assigned and approached, the responsibility regarding the participation of each collaborator in resolving and utilizing the work has been strengthened.

Thus, the new program is of a nature to provide a substantial increase in the percentage of the procedures of nonconventional machining in our industry and, ultimately, an alignment with the trends that appear on a world level.

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MICROBIOLOGY RESEARCH AIDING EXTRACTIVE, ENERGY INDUSTRIES

Bucharest STIINTA SI TEHNICA in Romanian No 5 May 81 pp 17-18

[Article by Dr Ioan Lazar, head of the Microbiology Laboratory, Bucharest Institute of Biological Sciences]

[Text] In the context of the current biological revolution, the expansion and penetration of biotechnology into the most diverse economic fields, the problems tied to the nutrition and energy of the future acquire new values and dimensions. At this point, a number of economically developed countries have a rich experience and wide-ranging programs in terms of biology and protein resources and also in terms of biology and new energy resources. In Romania, the party and state policy, the tasks that follow from the programs of directives endorsed by the 12th Congress of the RCP, the instructions directly received from party secretary general Nicolae Ceausescu at the time of his visits to the Institute of Biological Sciences in 1974 and 1979, and the guidelines that result from the October 1980 Working Conference With the Active in the Field of Geology significantly promote the development of a national program of biotechnology, a program which now is in an advanced stage of formulation and which focuses on the major issues of our economy.

The activity conducted so far at the Microbiology Laboratory of the Bucharest Institute of Biological Sciences already has produced a number of results that are appreciated by the various customer units. We shall dwell on a few of them.

Laboratory research, followed in the last 4 years by field experiments, demonstrated that the use of bacteria in processes for release of crude from deposits helps to increase the oil yield in wells.

Microbiological procedures for stimulating the release of oil from deposits is based on injecting into the deposit bacteria populations together with a nutritional support whose degradation produces large amounts of gas, organic acids and surfactants, products that aid the release of the remanent crude in the rock. This procedure, which was mastered and upgraded for the first time in this country by our laboratory -- in close cooperation with experts of the Cimpina Research and Design Institute for Petroleum and Gas, that completed more than 50 procedures on the site -- helped to demonstrate that in deposits which meet the requirements involved in the microbiological method rises between 15 and 150% in the crude yield in wells is obtained. More specifically, we point out that in wells where prior to the use of the microbiological method output was, for instance, 0.9-1 ton of crude/day, after the use of bacteria injections the crude yield went up to 1.4-1.5 tons/day. The duration of the positive effects of the procedure was from 1 to 4 years. (However, the high percentages were obtained at wells with outputs up to 0.5 tons of crude/day).

Because the microbiological procedure is very inexpensive, it can be applied by using the equipment in existence at oilfields, and so forth, in 1981-1982 it will be tested in deposits that include a larger number of wells, for the purpose of determining all resources for utilizing the method on an industrial scale.

In recent years these studies have been conducted with growing intensity in many oil-producing countries and Romanian experience has attracted the attention of experts. Moreover, some prestigious scientific events included our surveys in their programs.

Concurrently with research on promoting oil release by injecting a special bacterial inoculum adapted to oil deposits, other studies have commenced in the last 2 years, also in close cooperation with the Cimpina institute. These studies focus on obtaining bacterial polysaccharides (biopolymers), which will be used to dislocate the crude from collecting rocks. So far, bacteria strains with a high efficiency in terms of biosynthesis of biopolymers have been selected and the biopolymer which we have obtained in laboratory phase is assessed by experts of the Cimpina institute as qualitatively similar and hence competitive to American products.

Another direction also tied to the extractive industry in which our laboratory has accumulated useful results and experience involves the use of bateria to extract metals from poor ore or waste dumps and to remove sulfur from coal. In a number of countries including some neighbors, as for instance Bulgaria, large amounts of copper (up to 20% and even more from the annual output) are extracted by using the microbiological procedure. Our research conducted in cooperation with experts from specialized institutes in Baia Mare and Deva has so far focused on bacterial solubilization of copper and uranium. Moreover, under the 1981-1985 Five-Year Plan, research will be expanded to include also other useful elements such as zinc, lead, nickel, manganese, cobalt, and so forth. Studies in laboratory phase have permitted to obtain active bacteria populations for copper extraction, populations that have been taken over by experts in the network of benefitting units for the purpose of beginning to use them in practice. A significant input has also been provided into best possibly estimating the physiological and ecological factors that impact the process of solubilization of copper and uranium in poor ores.

Concerning removal of sulfur from coal with a high level of sulfur (more than 2-3%) by using bacteria, the studies conducted by our laboratory, in conjunction with the Faculty of Technological Chemistry of the Bucharest Polytechnic Institute, are among the few of this kind in the world. They demonstrated that a large amount of pyritic sulfur contained in coal can be removed or transformed with the aid of bacteria. For the time being, the method can only be used for coal sludge that results from flotations. The use of bacteria to remove sulfur from coal, however, has outstanding prospects — in terms of potential uses — in desulfurization of liquid or gaseous fuels that result from liquefaction or gasification of lignites.

The third investigative direction of the laboratory which we would like to discuss very briefly involves obtaining energy from unconventional sources. So far the research team involved in this project has obtained interesting results in the area of isolating bacterial populations for the purpose of developing an inoculum that generates the increase in the rate of conversion into biogas of the mud in hog-raising complexes; detecting new, still unused, substrata that would yield biogas and devising new approaches that would permit the increase in the production of biogas in the case of anaerobic fermentation of muds in animal-raising complexes or in the urban waste water treatment stations. The bacterial populations selected in recent years, the thought of creating an inoculum on a solid support, and the addition of special ingredients to zootechnological or urban muds, now fermented anaerobically for the production of biogas open up very promising prospects for raising the rate of conversion in fermentation combustible gases. Laboratory studies in recent years have determined that the special ingredients, just as the inoculum on solid support, which produce important increases in the production of biogas, are based on the use of a residual mud from a specific kind of factories in the area of industry, a mud which so far has nowhere in the world been capitalized on to the benefit of the factories that produce it. Moreover, during the last year, utilization of these ideas has also involved for our laboratory two proposals for invention.

Furthermore, in a rather advanced laboratory stage are surveys that focus on obtaining methane by reducing carbon dioxide by means of methanogenic bacteria. Resolving such a problem is of outstanding importance specifically if we consider the large resources of carbon dioxide in existence. However, for the time being these surveys have a basic character not only in this country but on a world scale also. Consequently, the industrial uses of this new source of energy belong to the not too near future.

Beginning with the 1981-1985 Five-Year Plan, the Microbiology Laboratory has been preparing to tackle also other directions for the purpose of obtaining energy from unconventional sources, notably obtaining energy-carrier alcohols (for example ethyl alcohol) from biomass and pulp waste and obtaining hydrogen with the aid of microorganisms.

11710
CSO: 2702

DATA ON ROMANIAN APPARATUS USED ON JOINT SPACE FLIGHT

Bucharest VEAC in Romanian Jun 81 p 6

[Unattributed article]

[Text] A good portion of the research and experiments done by the first Romanian cosmonaut Dumitru Prunariu and the pilot, Soviet cosmonaut Leonid Popov, on board the Soyuz-40, Salyut-6 and Soyuz -T4 was done with apparatuses conceived and created by specialists from Romania.

This research can be divided into three big categories: physical, technological and medical. The one named Astro held an important spot in the physical experiments. Its purpose was to seek and study incompletely ionized atoms, to investigate the processes of fragmentation and interaction of the heavy cosmic ions of high energy, to obtain their spectra charge and energy and to identify new forms of existence of nuclear matter (incompletely ionized atoms from cosmic radiation or nuclei with a large number of neutrons). These data are very necessary to the studies of nuclear physics, and astrophysics of high energies and the physics of heavy ions. In order to do the experiments, the specialists from the Astronomy and Space Sciences Center and from the Institute of Nuclear Physics and Engineering in Bucharest built two apparatuses. The first, Astro-1, assembled on the exterior of Salyut-6 four years ago when it was launched, is recording cosmic radiation completely, eluding the effect of the cabin walls. The second apparatus, Astro-2, brought there in Prunariu's "luggage," is noted by its highly miniature state, reduced energy consumption, high reliability. Placed inside the station and controlled by an electronic and mechanical system it localizes the latitude at which each particle is recorded. These apparatuses—which are an innovation at the world level--are supplied with plastic detectors which, following irradiation in cosmic space, were brought back to earth by the Romanian cosmonaut to be studied in Bucharest. The other complex for physical research, Biodose, was composed of two experiments: "complete" and "minidose," with the particular apparatus also created by Romanian specialists. The "complete" experiment proposed to measure the flows and spectras of the heavy cosmic ions in various points of the orbital laboratory. At the end of the mission, Prunariu brought back to earth the blocs of detectors (in order to be studied in Romania), with the remainder of the apparatus continuing to record the particular data. During the second experiment, the Romanian cosmonaut, with the aid of the Minidose-178 apparatus, measured the flow of protons from the earth's radiation belts. The purpose of this experiment lies in better estimating the radiation risks to the human teams on the space missions. Another group of research, Nanobalance, is at the borderline between physical and technological. Done with apparatuses conceived and built at the Cluj-Napoca Institute for Isotopic and Molecular Technology, the experiments mentioned led to obtaining some interesting information on the establishment of thin protective strata of silicon dioxide under the action of the cosmic atmosphere (radiation, vacuum and so forth) in order to determine how long such a protective stratum can last. The Romanian apparatus determines the mass of a thin stratum with a precision of up to one-tenth of a billionth part of a gram. Capillary-1 was an experiment with a purely technological nature. Both the apparatus as well as method utilized are firsts in the history of space research. This technology sought to determine the possibilities of obtaining monocrystals preestablished by using the capillarity effect. The method can produce results only in outer space, since gravity on earth creates many difficulties in applying it. In the near future, the experiments from the Capillary series (2 and 3) will have as their purpose obtaining utilizable silicon monocrystals even on board the spaceships (solar batteries). Thought out by Romanian specialists at the D. Danielopolu Institute for Normal and Pathological Physiology and the Center for Space Medicine and the St. S. Nicolau Virusology Institute and other institutes and done with apparatuses conceived and built nearly entirely in Romania, the medical research also included many series of experiments: Miocardia (seeking cardiac phases under the conditions of a space flight), Ballisto (analyzing the force of cardiac contraction under circumstances impossible to achieve on earth), Homeostasis (investigation of hormonal and enzyme changes), Immunity (the study of the organism's defense capability toward viruses), Information (following various mental processes and qualities of the cosmonauts), Reo (knowledge of the change in cerebral blood circulation as well as central and peripheral in various stages of the space mission), Collar (oriented toward the study of the effect of imponderables on the organism) and Pneumatic (obtaining data on the reaction of the cosmonaut's organism in the period of adaptation to the imponderables). It should be noted that the experience gained by the Romanian specialists in creating some of these medical apparatuses will be utilized in building high-performance installations for use on earth.

The complete success of this space mission--due to which Romania has entered among the countries participating directly in space exploration--was a prestigious contribution to the progress of science and technology placed at the service of man, civilization and peace.

8071
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- END -

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11 September 1981

East Europe Report

SCIENTIFIC AFFAIRS

No. 714

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11 September 1981

EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 714

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BRIEFS

NUCLEAR PLANT TO PROVIDE HEAT--In 1982, work will begin on construction of a 23-kilometer-long heating system for the residential and industrial areas of Trnava. The source of the heat will be the nuclear power plant in Jaslovske Bohunice, whose reactor generates 1,300 megawatts of thermal energy to produce 440 megawatts of electrical power. Thus currently only 30 percent of its thermal energy is utilized; the rest is cooled and then released into atmosphere. The pipeline will form a third cooling circle; the water heated by the nuclear power plant to 150 degrees of Celsius will drop its temperature to 60 degrees after producing heat for the town of Trnava. Even then, it will be sufficiently warm for subsoil heating of vegetable fields. The 240-megawatt thermal capacity of the system should cover Trnava's expected needs in 1990. Since the heat will be received via a turbine, there will be no danger of contaminated water entering residences. The system will be protected against other calamities as well. In the event of a breakdown at the nuclear power plant, the heat transfer stations or the pipeline, heat will be received from the current coal-burning heating plant, which will be kept in reserve. The new project is expected to save 300,000 tons of brown coal, will cost Kcs 350 million and should be completed in 1986-1987. The system would also make technologically possible to heat the nearby towns of Piestany and Hlohovec. [Editorial report] [Bratislava PRACA in Slovak 26 Aug 81 p 4]

CSO: 2402/79

LAW ON COLLECTION, STORAGE OF RADIOACTIVE WASTE PUBLISHED

West German Commentary

Bonn IWE-TAGESDIENST in German No 89, 18 Jun 81 p 1

[Report from Berlin: "GDR Establishes Central Repository for Radioactive Wastes." A translation of the East Berlin GESETZBLATT law cited below follows this commentary.]

[Text] A new order by the East Berlin Office of Atomic Safety and Radiation Protection takes effect on 1 July concerning the central recording and storage of radioactive waste. The final disposal area is Morsleben in Bezirk Magdeburg (near Marienborn); the deposit as such is an underground salt dome. The order obligates all enterprises and institutions, which generate radioactive waste, to collect it, process it, provide intermediate storage, and finally to deliver it to the central terminal disposal area. Complete documentation must be maintained as to the type and quantity of developing atomic waste. For "compelling technical and economic reasons" special regulations with specific time limits may be issued by the central recording and final storage authority. Interim regulations apply furthermore until the final disposal facility is fully operational (GESETZBLATT, I, 16/81).

Text of Law

East Berlin GESETZBLATT DER DEUTSCHEN DEMOKRATISCHEN REPUBLIC in German Part I No 16, 10 Jun 81 pp 224-226

[Official text of "Order on Central Collection and Final Storage of Radioactive Wastes, dated 11 May 1981," signed by Prof Sitzlack, MD, state secretary, president, State Office for Nuclear Safety and Radiation Protection]

[Text] On the basis of Articles 16 and 29 of the 26 November 1969 Radiation Protection Decree (GBL, II, No 99, p 627), the following is hereby ordered for the sake of the safe recording and final deposit, in a manner effective for the national economy, regarding radioactive waste in agreement with the directors of the competent central government agencies and in agreement with the Federation Executive of the Free German Labor Union Federation:

Article 1. Area of Applicability

(1) This order applies to the following:

Government agencies and economy-managing agencies,

Combines, combine enterprises, enterprises and installations (hereafter referred to as enterprises),

which operate nuclear plants, which handle radioactive materials or which operate radiation installations containing enclosed radiation sources.

(2) This order applies to solid and liquid radioactive waste where decay in 200 days, below the boundary values determined by law[1], is not possible.

(3) This order does not apply to the storage of materials and waste materials containing natural radionuclides on dumps and disposal areas[2].

Article 2. Basic Principles

(1) Radioactive waste according to Article 1, paragraph 2, must be recorded and final-stored in a central manner.

(2) The purpose of central recording is the transfer of radioactive waste by the government agencies, economy-managing agencies, and enterprises, where waste develops, in combination with the acceptance of this waste by the enterprise which is charged with central recording and final storage of radioactive waste[3].

(3) The purpose of central final storage is the placement of radioactive waste, to be centrally recorded, in a place for permanent storage under conditions which are suitable for the isolation of radionuclides from the environment until the current values have fallen below the specified boundary values.

(4) In planning, preparing, and executing investments and processes for the operation of nuclear plants or radiation installations, which contain enclosed radiation sources, and in handling radioactive materials, the government agencies, economy-managing agencies, and enterprises must take into consideration the measures required for the collection, processing, intermediate storage, and delivery of radioactive waste to be centrally recorded.

(5) Radioactive substances or radioactively contaminated substances and objects may be turned over as radioactive waste for central pick up and final storage only if there is no further possibility of using these substances or objects or components, if they do not contain any usable secondary raw materials, or if recovery of secondary raw materials can be accomplished only with a heavy expenditure that would not be justifiable in the interest of the national economy.

(6) The yield of radioactive waste must be kept as small as possible. Radioactive waste must be converted into a form permitted for central recording and pick-up through processing[4].

(7) Radioactive waste, subject to central pick up and final storage, must be collected separately from all other waste and must be placed in intermediate storage in the control sector until transfer for central pick-up.

Article 3. Responsibility

(1) The government agencies, economy-managing agencies, and enterprises, where radioactive waste develops, are responsible for the collection, processing, intermediate storage, and transfer of radioactive waste for central pick-up.

(2) The enterprise which handles the final storage of radioactive waste is responsible for accepting radioactive waste for final storage.

(3) Government agencies, economy-managing agencies, and enterprises must carry out those control and safety measures for the collection, processing, intermediate storage, central pick up, and final storage of radioactive waste which will make sure that unauthorized access will be impossible.

Article 4. Documentation

(1) Government agencies, economy-managing agencies, and enterprises, in which radioactive waste develops, must maintain complete documentary evidence on the collection, processing, intermediate storage, as well as transfer of radioactive waste for central recording and pick up. They must guarantee enterprise control over the yield and where abouts of radioactive waste.

(2) The enterprise which handles central pick up and final storage of radioactive waste must maintain complete documentary evidence on the quantity, type, and origin of radioactive waste in final storage. It must assure enterprise control over radioactive waste which is accepted and placed in final storage.

Article 5. Radiation Protection License

(1) Along with the petition for the issue of a radiation protection license, it is necessary, in addition to the previously required documents[5], to submit the following data and evidence for radioactive waste to be handled for central pick-up:

1. Data on the anticipated yield of radioactive waste (quantity, activity concentration, radionuclide composition, chemical and physical properties);

2. Description of installations and plants for collection, processing, intermediate storage, and transfer of radioactive waste;

3. Data on documentary evidence kept regarding radioactive waste as well as on enterprise control and safety measures in accordance with the provisions of Article 3, paragraph 3, and Article 4;

4. Evidence to the effect that radioactive or radioactively contaminated substances and objects or components thereof, which are to be handed over as radioactive waste, cannot be further utilized, do not contain any further useful secondary raw materials, or that recovery of secondary raw materials can be accomplished only with a heavy expenditure that cannot be justified in terms of the national economy;

5. Evidence to the effect that radioactive waste meets the requirements, in terms of shape and properties, as well as the transfer and acceptance conditions;

6. Evidence as to contractual agreements with the enterprise responsible for central recording, pick-up, and final storage.

(2) In case of any intended changes, especially in case of a change in the yield, the type, and the properties of radioactive waste, government agencies, economy-managing agencies, and enterprises must request an amendment in the radiation protection license from the State Office of Atomic Safety and Radiation Protection.

Article 6. Performance Conditions

(1) The requirements regarding form and properties as well as the transfer and acceptance conditions for radioactive waste to be picked up in a central manner are guided by the order to be issued by the minister of coal and energy in agreement with the president of the State Office of Atomic Safety and Radiation Protection.

(2) The central recording, pick-up, and final storage of radioactive substances is connected with mandatory costs. The costs are to be borne by the government agencies, economy-managing agencies, and enterprises in which this radioactive waste develops. The costs are calculated on the basis of the particular applicable price chart.

Article 7. Exceptions

(1) If, for compelling technical or economic reasons, determinations in this order cannot be complied with in individual cases, then a special regulation, with a specific deadline, is to be requested in writing, regarding the intended deviations, from the president of the State Office of Atomic Safety and Radiation Protection by the directors of the government agencies, economy-managing agencies, or enterprises. The petition must contain the following data:

1. Detailed data on deviations from the determinations in this order, along with justifications;

2. Data and justification for duration of validity of special regulation;

3. Data as to how radiation protection and safety in the collection, processing, intermediate storage, and transfer of radioactive waste for central pick-up can be guaranteed through other measures and means.

(2) To the extent that these special regulations touch the task sphere of other central government agencies, they must be made in agreement with the directors of the participating central government agencies.

Article 8. Transition Regulations

(1) Until complete acceptance of the pick up function by the enterprise, which is to handle central recording, pick up, and final storage, the State Office of Atomic Safety and Radiation Protection will also record those radioactive waste items which do not meet the requirements, in terms of shape and properties, as well as the transfer and acceptance conditions for radioactive waste to be centrally recorded. Details on this will be determined by the particular radiation protection permit.

(2) Government agencies, economy-managing agencies, and enterprises, which have a radiation protection license or which have submitted an application for the issue of a radiation protection license, are obligated, directly, but at the latest up to 2 years after the entry into force of this order, to submit data and documentary evidence, in accordance with Article 5, paragraph 1, for the supplementation of radiation protection permits to the State Office of Atomic Safety and Radiation Protection.

Article 9. Final Provisions

(1) This order takes effect on 1 July 1981.

(2) The following are at the same time rescinded:

Article 23 of the First Implementing Regulation of 26 November 1969 for the Radiation Protection Decree (GBL, II, No 99, p 635),

The Guideline for the Central Recording of Radioactive Waste of 28 March 1974 (Communication of the State Office of Atomic Safety and Radiation Protection, 1975, No 5).

FOOTNOTES

1. At this time, Article 22, paragraph 3, of the First Implementing Regulation of 26 November 1969 to the Radiation Protection Decree is applicable (GBL, II, No 99, p 635).

2. Currently, the Order of 17 November 1980 on guaranteeing radiation protection in dumps and industrial waste disposal areas and in the use of materials deposited there is applicable (BGL, I, No 34, p 347).

3. VE Combine Nuclear Power Plants "Bruno Leuschner," final storage operation for radioactive waste, 3241 Morsleben.

4. Currently, the definition according to TGL [GDR norms] 25296/02 is applicable: "Treatment of radioactive waste for concentration of radionuclides in a form favorable for waste deposit and recovery of inactive carrier substance, that is to say, all process steps which are connected with the processing of radioactive waste, such as reduction of its volume, consolidation for the purpose of fixation of radionuclides prior to processing and final storage."

5. Currently, the First Implementing Regulation of 26 November 1969 to the Radiation Protection Decree is applicable (GBL, II, No 99, p 635) along with the Appendix to the 21 June 1979 Nuclear Plant Licensing Order (GBL, I, No 21, p 198).

5058
CSO: 2302/8

AGRICULTURAL, FOOD MACHINERY PRODUCTION SURVEYED

East Berlin AGRARTECHNIK in German Vol 31 No 4, Apr 81 pp 146-148

/Article by Dr K. Ulrich, engineer, Chamber of Technology, VEB Fortschritt Agricultural Machinery Combine, Neustadt in Sachsen: "Survey of Important Machine Systems for the Agricultural and Food Industries Produced by the VEB Fortschritt Agricultural Machinery Combine, Neustadt in Sachsen"7

/Text7 1. Introduction

The 30 years of development of the VEB Fortschritt Agricultural Machinery Combine are closely linked with the development of user-oriented machine systems for the agricultural and food industries.

While in the first decade following the establishment of the combine first simple, then increasingly more complicated individual machines were developed and produced, the designing of machine systems for GDR socialist agriculture was begun in response to the demand made by the Seventh German Farmers Congress in 1964. With the introduction of industrial production methods in agriculture and the associated concentration and specialization of production, at the beginning of the 1970's there arose the need to develop, as a technical basis of industrial production methods, and to make available comprehensive machine systems which guarantee[1] "the production of an agricultural product, as far as possible, ranging from the first stage of production to processing." In hindsight it can be stated that there are close correlations between the development of machine systems and the social development of the agricultural and food industries. Every stage of development in the socialist agricultural and food industries requires an appropriate technical-technological level of machine systems, whereas the machine systems for their part represent an important basis for the steady further development of this important branch of the economy.

2. Overview of the Machine Systems

By concentrating agricultural machinery construction in the GDR effective 1 July 1978 in the VEB Fortschritt Agricultural Machinery Combine it was established that the following machine systems are the responsibility of this economic unit:[2]

--grain production and processing

--cereal forage production and processing

--potato production and cleaning

--sugar beet production

--cattle production

--pig production

--milk processing

--soil cultivation, tilling, fertilizing, cultivating and crop protection

--tractors and agricultural transport and transshipping equipment.

Moreover, the development, production and sale of important component products, including products such as engines, transmissions, car heating systems, chains, fire extinguishers, consumer goods and so forth, are to be implemented.

By virtue of the above-mentioned systems, the VEB Fortschritt Agricultural Machinery Combine represents the most important machine systems for crop and animal production and for the food industry. Because of the great diversity, the individual machine systems are worked on and completed in extensive national cooperation with production enterprises of socialist agriculture and other industrial branches and as international cooperation or specialization with the CEMA countries.

The machine systems for the GDR agricultural and food industries are developed on the basis of an agreement which was concluded between the MALF /Ministry for Construction of General Machinery, Agricultural Machinery and Vehicles7 and the MLFN /Ministry for Agriculture, Forestry and Foodstuffs Industry7.[3]

This agreement is the basis of contractually regulated scientific cooperation between the VEB Fortschritt Agricultural Machinery Combine and the GDR ADL /Academy of Agricultural Sciences7 and its institutes in order to implement research and development, coordinated in terms of substance and time, of new procedures and machine systems.

With the combine's strong growth in export volume it was necessary in designing the machine systems and the individual machines to consider from the very beginning the requirements of the chief exporting countries and to develop special variants in the machine systems.

By utilizing the high complexity of the machine systems, for example, machine system variants for rice production and processing and grain corn production and processing were developed in the combine for export. Thus, the appropriate export countries also have universal systems at their disposal. Such measures to modify machine systems will take on increasing importance.

Figure 1 provides an overall schematic representation of the machine systems of the VEB Fortschritt Agricultural Machinery Combine. The machine systems for crop production in each case begin with the subsystems for producing the individual products which are intended, via mechanization means, for soil cultivation, tilling, fertilizing, cultivating and crop protection.

2.1 Machine System for Grain Production and Processing

This machine system ranges from the mechanization means for producing grain up to important final products for human nutrition, such as baked goods, foodstuffs, flour and beer. The combine develops and produces complete installations and all important individual products. It is divided as follows into subsystems:

--Grain Production

--Grain Harvest

Harvester-threshers E 512 and E 516 in a large number of export variants, self-propelled forage harvester E 281 and high pressure press K 453 for harvesting straw, coordinated in performance with E 512 and E 516.

--Grain Silo Installation

Complete grain silo installations, in metal for up to 14,400 tons and in concrete for up to 140,000 tons storage capacity; grain dryers, grain cleaning machines, conveyor systems, dust removal systems and other individual pieces of equipment.

--Seed Silo Installation

Complete seed silo installations for up to 8,000 tons storage capacity, complete seed cleaning facilities; seed cleaning machines (sieve sorters, indented cylinders), belt dryers, ventilated metal silos, laboratory machines and other individual machines.

--Wheat and Rye Mill

Complete wheat and rye mills for up to 250 tons per 24 hours processing capacity; double roller frames, sifters, dry stone separators, grain cleaning machines and other individual machines.

--Bakery

Complete lines for producing bread and rolls with a working width of 2.1 and 3 meters; fully automatic machines for dividing and working dough for rolls, intensive kneading machines, cutting machines for baked goods, ovens and other individual machines; dough processing machines from the CSSR and Hungary are integrated into the bread and roll lines.

--Husking Mill

Complete rice mills in frame design for up to 40 tons per 24 hours, oat mills, barley mills, cleaning facilities for legumes; individual machines for husking mills (husking operations, grinding operations, table sorters and others).

--Mixed Forage Works

Complete mixed forage works, from frame design up to large process computer-controlled mixed forage works with 200,000 tons annual processing capacity; pellet presses, hammer mills, batch mixers and other individual machines.

--Malt House

Complete malt houses with an annual capacity of up to 60,000 tons of malt.

--Brewery

Complete breweries of various kinds with a broad assortment of individual pieces of equipment.

2.2 Machine System for Cereal Forage Production and Processing

This includes the mechanization means which are necessary from the planting of cereal forage up to the availability of fresh forage, silage, dry feed, hay and feed pellets. The combine makes this machine system in close coordination with the production enterprises of agriculture and other industrial branches. The machines, which determine output, are produced by the combine. The technological basic quantities are universally coordinated for the machine system. It is divided into the subsystems

--Cereal forage production

--Cereal forage harvest

Self-propelled swath movers # 301 and # 302, including swath processing equipment and mowers for the pea and grain harvest; self-propelled forage harvester # 281 with field forage mower, pick-up machines, corn mowers and corn cutter (Hungary); high pressure press K 453 for hay and straw harvesting, in variants for different kinds of use; rotary mowers for tractors (CSSR).

--Vertical and Horizontal Silos

The subsystem is realized by the Nauen Equipment Combine for Cattle Plants VEB and by enterprises for agricultural construction.

--Drying Works

This subsystem is taken care of by the Stassfurt Chemical Building Plant VEB; the combine produces plant parts, such as the rack press installation, as well as individual machines like hammer mills and pellet presses.

--Storage Rooms and Cold Air Drying Installations

These primarily include storage rooms as a result of agricultural construction, cool air ventilation devices from the Meissen Turbo Works VEB.

--Feed Pellet Plants

Complete feed pellet plants in frame design for processing straw, sugar beet chips, grain, molasses and other components; partial installation for NaOH hydrolizing; special feed presses which process straw and other components; hammer mills.

2.3 Machine System for Potato Production and Cleaning

This includes the mechanization means for potato production up to delivery of packed raw goods or peeled potatoes. Characteristic of this machine system is the long-term specialization by the GDR on potato harvesting machines and by the CSSR on potato planting machines within the framework of CEMA's division of labor.

--Potato Harvest

Potato diggers, two and three row capacity, potato collecting diggers and potato separators for two rows in many variants; potato weed cutters as a cultivating device from Poland; variants of the digger for havesting onions and carrots.

--Potato Cleaning

Complete cleaning, storage and marketing plants for up to 30,000 tons of potatoes, automatic sorting plants to supplement the diggers and other individual machines.

2.4 Machine System for Sugar Beet Production

This includes all the mechanization means which are needed by agriculture, ranging from sugar beet production up to delivery of the harvested sugar beets to the sugar mill.

The high level of specialization in developing and producing the machines in specific CEMA countries is characteristic of this, too. Thus, the CSSR is responsible for the development and production of self-propelled machines for harvesting beet leaves. The USSR is the final manufacturer of self-propelled machines for beet digging. Within the framework of specialization, for the KS-6 self-propelled beet digger the combine delivers the cabin, digging units and conveyor facilities. Single seed sowing machines of various designs are produced as an important final product of the combine itself for this machine system.

2.5 Machine System for Pig Production

This combines the equipment for facilities for pig breeding and fattening. The main part of the mechanization means is developed and produced by the Cottbus Pig Production Equipment Combine VEB. The VEB Fortschritt Agricultural Machinery Combine, on the other hand, produces lines for steaming the potatoes and other equipment and is the general contractor for plants for pig production for export.

2.6 Machine System for Cattle Production

This includes equipment of various cattle production installations for breeding, fattening and milk production for GDR agriculture and export customers.

The combine designs and delivers completed plants for cattle production and efficient individual machines. The machine system for cattle production is realized in close coordination with the Nauen Equipment Combine for Cattle Plants VEB and other enterprises. It is divided in the following subsystems:

--Keeping Equipment

Keeping equipment for breeding, fattening and milk production plants.

--Feeding Equipment

Plants for feed preparation and distribution, even at the location of the animal, mobile feeding equipment.

--Milk Extracting Equipment

Complete plants for obtaining milk, according to the number of animals and stabling method: direct-to-can milking installations, mobile pasture pipe milking installations including machine cars, mobile pasture direct-to-can milking installations, pipeline milking installations, herring bone milking rooms, carousel milking installations. Installations for cooling milk.

--Manure Removal Equipment, Liquid Manure Equipment

Installations to remove stable manure and liquid manure, tractor trailers to transport and distribute stable manure and liquid manure.

--Cleaning and Disinfecting Equipment

Hot water pressure cleaning devices, disinfecting equipment.

2.7 Machine System for Milk Processing

It starts with the mechanization means for receiving the milk and ends with the milk products ready for market, such as drinking milk, cottage cheese, butter and other items. The VEB Fortschritt Agricultural Machinery Combine develops and delivers complete milk processing lines with a handling capacity up to 20,000 liters per hour and individual machines such as separators, plate heat exchangers, cream ripeners, butter machines, cottage cheese separators, pumps of various types. The separators are also utilized, in a modified designed, for many other liquids, such as oils for human nourishment and technical purposes, chemical liquids, beer wort, fruit juices and others.

2.8 Machine System for Soil Cultivation, Tilling, Fertilizing, Cultivating and Crop Protection

This machine system which includes all mechanization means for the production of primary crop products has a cross-sectional character and, with selected mechanization means, is an integrated component in the machine systems for crop production. It is divided into the following subsystems:

Soil Cultivation

Plows of various designs for cultivating the soil, share stubbling plows, grubbers, various kinds of devices for leveling, crumbling and packing the plowed soil, and other devices.

--Tilling

Drill machines with various working widths from 2.50 to 9.20 meters (with coupling car), single seed sowers for sowing sugar beets and other seeds; in the framework of CEMA, Romania is responsible for corn planting machines, the CSSR for potato planting machines.

Fertilizing

Tractor trailers to transport and remove stable manure and liquid manure; truck spreading attachment for IFA W 50 trucks to transport and deliver mineral fertilizers, endgate manure spreaders for tractors.

--Cultivating

Cultivating equipment for use with tractors.

--Crop Protection

In the framework of the international division of labor for CEMA agricultural machinery construction all devices for crop protection are developed and produced by Hungary with consideration of the demands of GDR agriculture. Crop protection machinery, pulled by tractors and mountable on trucks, for the most diverse applications.

2.9 Tractors and Agricultural Transport and Transshipping Equipment

--Tractors

Tractor ZT 300 with a 74 kW engine, in standard design and also all-wheel drive, in many export variants; in line with the division of labor in CEMA, completion of the tractor fleet for GDR agriculture is accomplished mainly by imports from the USSR and Romania.

--Agricultural Transport Equipment

Special trailers for stable manure and other transport goods, tank trailers for liquid manure and other liquid materials; agricultural truck IFA W 50 from the service truck combine, special agricultural tipping trailers from the combine for trailers and special attachments, also with special attachment for trucks and tractors.

--Transshipping Equipment

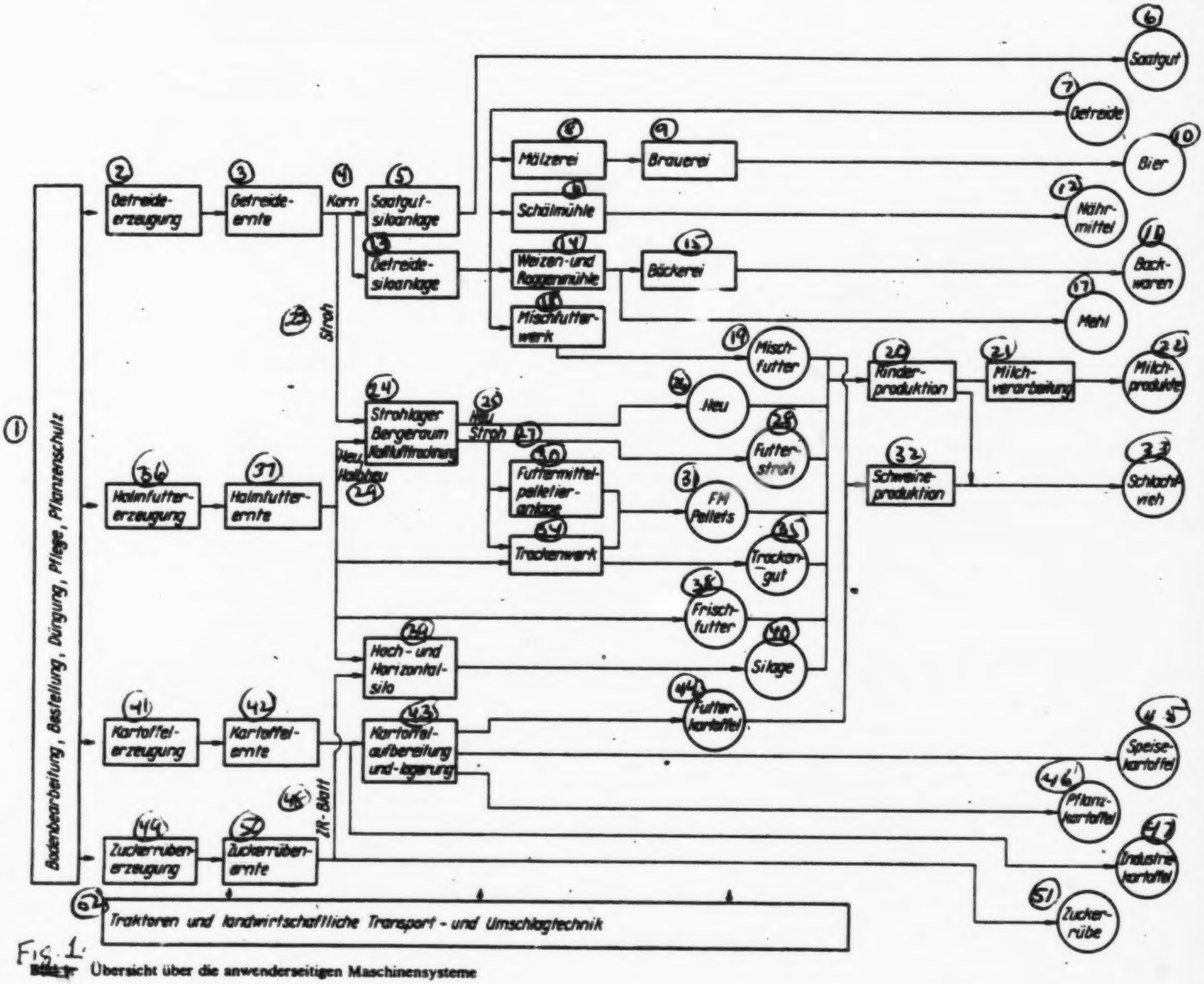
Mobile cranes and diggers for a variety of uses in agriculture, a broad assortment of conveyor belts, freight car loading equipment, front loaders for tractors, conveyor blowers for grain and cereal.

3. Concluding Remarks

Of the very extensive machine systems taken care of by the VEB Fortschritt Agricultural Machinery Combine, Neustadt in Sachsen, it was possible to give only a concise overview. Increasing importance attaches to the development of machine systems in combination with the development of processes for the agricultural and food industries within the national and international framework.

The machine systems underlie a high dynamic because of the broader horizontal and vertical integration of the labor processes of the agricultural and food industries, the necessary minimizing of energy and material outlay for production and in the use of agricultural equipment, of additional increases in work productivity as well as a decrease in losses and increasing the quality of crop and animal products. The high rates of increase for export which are to be realized in the interest of the economy require, in addition, the development of special variants of machine systems in order to better deal with diverse conditions of use.

The machine systems described for the agricultural and food industries are the basis for designing the reproduction process in the combine, starting with research and development, via production up to effecting the sale and export and import.


①
Bodenbearbeitung, Bestellung, Düngung, Pflege, Pflanzenschutz
②
Getreide-erzeugung
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Getreide-ernte
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Korn
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FM Pellets
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Halmfutter-erzeugung
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Halmfutter-ernte
Frisch-futter
Hoch- und Horizontal-silo
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Silage
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Kartoffel-erzeugung
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Kartoffel-ernte
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Kartoffel-aufbereitung und -lagerung
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Futter-kartoffel
Speise-kartoffel
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Pflanz-kartoffel
Industrie-kartoffel
ZR-Blatt
㊾
Zuckerrüben-erzeugung
㊿
Zuckerrüben-ernte
(51)
Zucker-rübe
(62)
Traktoren und landwirtschaftliche Transport- und Umschlagtechnik

Fig. 1. Übersicht über die anwenderseitigen Maschinensysteme

Figure 1. Overview of Users' Machine Systems

Key:
1. Soil cultivation, tilling, fertilizing, cultivating, crop protection
2. Grain production
3. Grain harvest
4. Grain
5. Seed silo installation
6. Seed
7. Grain
8. Malt house
9. Brewery
10. Beer
11. Husking mill
12. Foodstuffs
13. Grain silo installation
14. Wheat and rye mill
15. Bakery
16. Baked goods
17. Flour
18. Mixed forage works
19. Mixed forage
20. Cattle production
21. Milk processing
22. Dairy products
23. Straw
24. Straw storage, storage room, cold air drying
25. Hay
26. Hay
27. Straw
28. Feed straw
29. Hay, part hay
30. Feed pellet plant
31. Feed pellets
32. Pig production
33. Cattle
34. Drying works
35. Dry feed
36. Cereal production
37. Cereal harvest
38. Fresh forage
39. Vertical and horizontal silo
40. Silage
41. Potato production
42. Potato harvest
43. Potato cleaning and storage
44. Feed potato
45. Eating potato
46. Seed potato
47. Industrial potato
48. Sugar beet leaf
49. Sugar beet production
50. Sugar beet harvest
51. Sugar beet
52. Tractors and agricultural transport and transshipping equipment

FOOTNOTES

1. Gruenbeberg, G. "What Are Industrial Production Methods in Agriculture?" NEUS DEUTSCHLAND, Vol 26, January 1972, p 3.

2. Bylaws of the VEB Fortschritt Agricultural Machinery Combine, Neustadt in Sachsen, 1 Dec 1979, par 3.

3. Agreement between the MLFN and the MALF concerning cooperation in the sector of research, development and application of machine systems to the comprehensive mechanization of crop and animal production.

12124
CSO: 2302/6

REGULATORS INADEQUATE STIMULI TO TECHNICAL DEVELOPMENT

Budapest MUSZAKI ELET in Hungarian 24 Jul 81 pp 3, 4

[Interview with Dr Gyula Szeker, chairman of the National Technical Development Committee, by Gyorgy Pongracz: "The Basic Task of Technical Development: Improving Competitiveness"]

> [Text] Economic contradictions are sharpening to an increased degree in the world economy today. This process is in a natural causal relationship with the slowing of economic development, which necessarily brings with it ever greater significance for technical development. An innovation centered economic policy having as its goal a continual renewal of the production and product structure is coming to the fore everywhere today, but especially in countries poor in raw materials and fuels. In this changed economic situation the extra profit comes from products which are new by international standards, products which contain a greater proportion of the achievements of science. The changed economic situation is indicated and strengthened by the fact that the 1980's are a new period in the unfolding of the scientific-technological revolution. In this new situation greater value is given to the significance of science and of technical development in our homeland, and throughout the world. So increasing the speed and effectiveness of technical development is becoming a key question.

[Question] How is the Hungarian people's economy preparing for all this?

[Answer] Qualitative changes and a shift of emphasis have taken place in our technical development policy. Research and technical development, which earlier were sometimes goals in themselves, are increasingly intertwined with the market oriented economic activity of the enterprises. The take-over, swift adoption and further development of foreign technical information which is new for us, in the form of licenses, is becoming a significant factor. The enterprises are gradually recognizing that without effective technical development they will be increasingly less capable of keeping up in the sharpening economic competition. But if this change in attitude is to receive greater scope in practice fundamental significance attaches to central guidance and a consistent implementation of a technical development policy conception for the working out of the Sixth Five-Year Plan conception. In this they formulated technical priorities for the Sixth Five-Year Plan which were included in the plan law as follows: "In technical development priority must be given to trends which significantly improve the technical level, quality and economical production of products, which increase the efficiency of materials and energy use, which result in a modernization of technologies including efficient automation and which aid mass manufacture of parts and subassemblies and production of complete industrial technologies and complex systems."

[Question] Economic competition is sharpening and the enterprises are only gradually recognizing this. Are they too slow to do so?

[Answer] The low efficiency of technical development derives primarily from the fact that the economic regulators do not make the enterprises feel the pressure of technical development enough, do not encourage them to undertake the risk accompanying innovation. So we must try as soon as possible to see to it that the regulator system creates an even more favorable atmosphere for technical development, encouraging the enterprises substantially more than heretofore to accelerate technical development. We should not forget that even heretofore we have turned significant sums to research and development, nearly 90 billion forints between 1976 and 1980, and the expenditures in the Sixth Five-Year Plan are expected to come to 3 percent of the national income. The Sixth Five-Year Plan law--in harmony with the economic policy conception approved at the 12th congress of the MSZMP--prescribes the development of a new type of medium range research and development plan for national guidance of research and development. This will provide significant sums from central resources for technical development which can be realized within the enterprise decision sphere, in addition to the programs of national significance.

[Question] So technical development must be realized at every level of economic guidance and such tasks can be well distinguished.

[Answer] Naturally with different contents at different levels, but it is an important activity at the enterprise and state level alike. Each must find their own system of tools and institutions, with special regard to the fact that the scale of those participating in technical development work is very broad and it is difficult to coordinate this extensive activity. An important organizing force is represented by the innovation chain which puts research-development-marketing-application (use) into a uniform system and coordinates the mutual effects of every member of the chain.

[Question] In what areas can we regard our technical development effective?

[Answer] A large part of our research work is of a following character. Experience shows that we have been able to achieve outstanding results where the influence of the market on the producing activity of the enterprise was greater than average, thus influencing research and technical development as well, and where we had well defined, concretely formulated developmental goals and where the realization of these was regulated by centrally organized and guided programs. As examples I might mention the pharmaceutical industry, telecommunications and vacuum technology, the aluminum industry, manufacture of highway vehicles, crop production and certain branches of meat production.

[Question] But this is not at all characteristic in general.

[Answer] It is true that we have not succeeded in raising technical development activity to the desired level on a broad scale. The pace of development is not satisfactory partly because in some extraordinarily important areas--such as microelectronics and the development of biologically active materials, crop protection materials and chemical industry intermediaries--we have not been able to follow the swift technical and scientific development of the world and partly because the backward areas hold back and even drag down the others. The weaknesses of our technical development can be attributed, going beyond the sphere of technical development narrowly interpreted, to economic, social and awareness causes. Our interest system is not an adequate incentive for the realization of new things and our social values in general do not appreciate the search for new paths, being much more inclined to accept comfortable mediocrity. In this area the ability of our society to tolerate tension and conflict is less than could be desired. In accordance with our present attitudes the efforts and risk of innovation work would have to be rewarded primarily with material recognition while comfortable work and avoidance of risk should suffer material disadvantage.

But the income regulation and wage policy principles in effect do not yet make this possible to the desired degree. Recognition proportional to the risk undertaken and the results achieved is not adequately solved for organizations or for individuals. Although we have given up leveling in principle in reality social pressure does not yet permit sufficient scope for differentiation. As I have noted already, the economic regulators in the past decade did not sufficiently force the enterprises to increase productivity and efficiency by accelerating our technical development. It was a serious obstacle that our industrial policy was not implemented consistently. It should have been the task of a comprehensive industrial policy to limit our too broad product scale and improve our inadequate production structure, but this was not accomplished in a worthy manner in a number of branches. Realization was not adequately programmed, not adequately controlled. We might add that cooperation, deliveries and contract discipline among economic organizations and enterprises which were supposed to cooperate were extraordinarily lax; the consequences of violations did not have to be borne by the enterprises and did not endanger the status of their leaders. As a result of all this most enterprises--although they are of small or medium size compared to the international monopolies competing with them--had to build up within their own organization a virtually complete vertical production process, increasing the internal technical development needs of the enterprises, resulting in parallel developments at a number of production units. But the causes for all this must be sought not in the thinking of technical experts but rather in the economic environment which has developed.

[Question] So some elements of the innovation chain are rather far from each other?

[Answer] Yes; indeed, the present organization of the management units of our economy, the separation of production and development, break the innovation chain. Investment, production, marketing and technical development are treated separately in the entrepreneurial process. All this produces a number of conflicts of interest. In essence technical development should be regarded as an economic undertaking being realized in the innovation process. But this presumes that where technical development cannot be based on enterprise initiative or where enterprise interest cannot be developed the state should take upon itself the full or partial designation, organization and conduct of technical development goals and actions.

[Question] To what extent is technical development an enterprise task and to what extent is it a state task?

[Answer] Quantitatively it is an enterprise task to a larger extent and a state task to a smaller extent. Everything which is possible at the enterprise level should be done there, but the solution of many tasks is possible only at the level of state guidance. State guidance should strive primarily to introduce new technology, to organize research and development tasks among branches and to force out the old, organizing programs and actions. One of the tasks of the OMFB is to select for the government, to prepare developmental decisions and to give an opinion on these tasks.

[Question] What resources are available to the enterprises?

[Answer] The most important source for enterprise technical development work is the technical development fund which is generated there and two thirds of which, as a national average, remains there, which covers almost all the technical research and development work which can be done or initiated at the enterprise. The existence of the fund encourages the enterprise to turn sufficient funds to an at least partial financing of medium or longer range technical development problems, despite the still short range interest system.

The other part is provided by state organs guiding the area from the centralized technical development fund. The basic principle is that the activity must be financed, not that the institution should be supported. So in the coming plan period we must think and act a good bit more resolutely than heretofore.

The OMFB--as the organ disposing of a part of the centralized technical development fund, using it in the interest of implementing the technical development policy--is turning increased attention to financial support for medium range research and development programs. These programs aid the achievement of the concrete social and economic (primarily industrial and agricultural) goals of socialist construction; they usually contain complex research and development tasks the results of which can be used primarily in the sphere of material production--thus by the enterprises.

[Question] What investment policy, credit and organizational measures are needed for this?

[Answer] One of the important tasks of investment policy is coordination of general and branch guiding principles for investment goals and technical development. The technical development priorities must be realized in the guiding principles of credit policy and in the system of preferences also. Organizational measures should see to it that our enterprises have the research, technical development and marketing organizations linked to the production and marketing process. The organizational modernization of the network of research institutions should be carried out in such a way that this improves conditions for innovation activity by the enterprises, strengthens the link between scientific research and higher education and reduces the isolation of the research institutes from the producing and marketing enterprises. We should give broad support to the creation of research and production--and even marketing--associations.

[Question] What sort of manpower movement will accompany all this?

[Answer] As a result of changes in the production structure and a greater differentiatoin in the economic achievements of the enterprises, naturally, we must count on an increase in manpower movement also. But this must be done not with administrative measures but rather on the basis of information which takes into consideration the trends of our technical development, with measures serving the retraining and further training of the labor force. We should continue to study the material situation of the technical intelligentsia and the social appreciation of their work. Today this is worse than desired.

[Question] Inventions and innovations are important parts of technical development.

[Answer] The majority of inventions are limited merely to technical improvements and perfections so they can play a role primarily in a dynamic maintenance of the technical level by the enterprises or perhaps in follow-up developments. The smaller part, the inventions of a pioneering character representing new directions in technical development, are those which can represent a significant technical-economic advantage, the possibility of a market break-through and extra profit. The task of the innovation movement is partly to contribute to improving the results of management, to developing more thrifty production involving less expenditure, and partly to increase the active, creative role of the workers in the production process. The number of inventions and innovations created and used can be regarded as small compared to the economic development of our homeland, to the size of the population and to countries at a similar level of development.

[Question] What are the most important tasks?

[Answer] With a correct utilization of the material resources for research and development we must strengthen the effect of science and technology on economic development and increase the contribution of research and development to the creation of national income, the modernization of the production structure and an improvement in the organized nature of the social division of labor. Going beyond material support for stressed research and development and central development programs at the national level and for ministerial programs the OMFB will give precedence in supports to those research and development tasks the results of which will make possible concrete economic exploitation within a short time, to those directed at the solution of scientific and technical problems which require high intellectual preparation and which are noteworthy internationally and to those which will help lay the foundations for social-economic tasks following the plan period.

[Question] What role does our technical development have in improving the foreign economic balance?

[Answer] Improving quality in the broadest sense is of absolute importance. Improving our competitiveness and our terms of trade is possible only with a constant improvement in quality and the technical level. But this may be the result of a longer process and it will require significant intellectual and material expenditures. Among our most important tasks in this area one might mention the use of designs ensuring the technical and economic optimum, increasing quantitative production of structural and other materials which make possible better quality and use of modern technology, improving the production structure, building operations and measurements into technological processes which serve quality control so as to force technological discipline, and the development of measurement techniques.

Naturally all this will require reliable, precise work by people working at every level of production.

[Question] A significant number of enterprises are not yet capable of meeting the high efficiency requirements expressed in world market prices. For the time being they are more concerned with their stability than with the development of longer range innovation plans. For this reason we should ensure over the medium and longer range the conditions for more effective guidance of scientific research and technical development.

[Answer] In the course of planning for the Sixth Five-Year Plan the modifications of the guidance of research and development developed in the desired direction, but to achieve the necessary acceleration we must concentrate our attention and resources on a few critical points. For example, our system of economic regulators should better stimulate technical development and there is need for a determined harmonization of investment goals and of the chief trends of technical development. In the interest of this the technical organs must be included to an increased degree in passing judgment on providing credit and funds for enterprises. Socialist economic integration provides a means to expand markets and production in such a way as to make possible the utilization of developed, highly productive technologies. And by means of capitalist cooperation we can gain access to modern products, manufacturing technologies and methods in such a way as to spare foreign exchange and increase our demanding capitalist markets. By purchasing licenses and know-how it will be possible to take over quickly technologies more developed than our own and more effectively concentrate our own more limited research and development capacity. Thus, in sum, in the interest of development in a good direction we must review and further develop, in harmony with social and economic conditions, the planning practice for scientific research and technical development and the decision making and regulatory system therefor.

Scientific research and technical development have an increasing role in the development of the economy especially under circumstances in which the raw material base in contracting, energy is becoming more expensive, marketing is becoming more difficult and economic growth is moderating. We must use the present period of more moderate economic growth in such a way as to turn greater attention to technical development and to improving the economic structure. In this way we can lay the foundations for later dynamic economic growth.

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COMPUTERIZED PLANNING SYSTEMS DESIGNED FOR AGRICULTURE

Bucharest ERA SOCIALISTA in Romanian No 9, 5 May 81 p 53

[Unsigned article]

The Arad Territorial Computer Center (CTCE), which next year will be 10 years old, has steadily developed its activity; during the last five-year plan its volume of services grew at an annual rate of 40 percent, and its labor productivity increased by an average of 23 percent.

One of the major directions for the Arad CTCE data processing activity has been in the domain of agriculture and the food industry, for two reasons: the importance of these branches in the county's economy, and their lag in information processing development. The Arad CTCE continues to devote attention to these specific local conditions. As a result, during this year as well, the number of planning contracts in agriculture and the food industry continues to exceed 50 percent of all its planning contracts.

In order to appreciate the importance of this orientation, we indicate below some of the achievements obtained in planning and using information processing programs and routines designed for agriculture and the food industry.

1. OPTRET--Effective Optimization of Manufacturing Formulas for Enterprises Producing Feed Blends--is designed for Enterprises for the Production of Feed Blends (IPNC). Basing itself on the raw material stocks available in the unit, the program establishes manufacturing formulas for producing feed blends for all breeds and categories of animals, and for each formula lists the essential characteristics for assuring nutritional elements. This program was implemented at the Arad IPNC, and its economic efficiency is estimated to equal an additional annual production of 3000 tons of feed blends, which in turn represents an additional 16 million eggs or 900 tons of pork meat.

2. OPTRET--a variant for the Timisoara Complex for Pig Raising and Industrialization, which includes in its structure three feed blends plants--differs from OPTRET-IPNC in the manner in which it communicates input data, final lists, and the formula re-optimization algorithm.

3. Another program, named PLANVEG, concerns the territorial distribution of plan tasks for major vegetal crops.

PLANVEG is offered as a planning instrument made available to agricultural directorates for agriculture and the food industry.

The plan indicators issued by the Ministry for Agriculture and the Food Industry (MAIA), regarding the areas covered by vegetal crops, as well as the average productions per hectare of these areas, are distributed over the territory of the agricultural directorate.

PLANVEG is aimed at vegetal crops in the groups: grain to be used as such, leguminous grains, and technical plants.

The product operates on the framework of any organizational structure with four levels. Given the current organizational structure of agricultural directorates, the levels which can be taken into consideration are:

Agricultural directorate;
State and cooperative unified agroindustrial councils;
Land improvements;
Lots.

In terms of the logical succession of problems solved, PLANVEG is composed of the following modules:

A. Economic assessment of agricultural land, using natural and intensified figures of merit for each organizational level;

B. Determination of average possible productions per hectare at each organizational level, as a function of the economic assessment of the agricultural land and of an analysis of dynamic sequences of average productions per hectare and crops, for the longest possible time period;

C. Correlation of average possible productions with the average productions communicated by MAIA, and establishment of a coefficient which expresses the contribution of advanced technologies in achieveing the average productions per hectare requested by MAIA;

D. Distribution of average productions per hectare among the various organizational levels, using a power mathematical function (COBBDOUGLAS) for the average production as a function of the figure of merit;

E. Distribution among the various organizational levels of the areas covered by vegetal crops, by using a linear programming economic-mathematical model.

PLANVEG offers two distribution variants for the areas covered by vegetal crops:

One variant takes into account the present planning methodology, which considers the crop coverage areas communicated by the ministry as compulsory;

Another variant which considers as compulsory only the total production of vegetal crops requested by MAIA.

The PLANVEG program can be applied in Arad County beginning with the 1982 plan year, with an estimated production increase of up to 8 percent through location of vegetal crops as a function of their favorable natural conditions.

4. In 1977, the Arad Aviculture State Enterprise began using a package of programs to select a light breed of chickens.

On the basis of observations and measurements conducted during one year on 20,000 birds, this application automatically calculates average values per bird and families, and selects the most valuable ones on the basis of qualitative criteria. This selection can be carried out on a nine-step value scale, whose final purpose is the reproduction of pure lines and improvements in the performances of their various characteristics.

As a result of the improved selection system, very large economic effects are obtained by populating the farms solely with high productivity birds. Four years of computer assisted selection have resulted in a competitive, high quality biologic material which can be exported.

During these four years, the average weight of eggs has increase by 4 grams, and during controlled periods of 20 weeks in 1977 and 1980, the number of eggs obtained per chicken has increased by ten. This means that the 20,000 laying hens of the Arad farm have produced an additional 500,000 eggs per year, following a four-year computer assisted selection.

The application has also been adapted for the Bucharest Aviculture Central.

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END

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21 September 1981

East Europe Report

SCIENTIFIC AFFAIRS

No. 715

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EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 715

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PSYCHOLOGICAL EFFECT OF TELEVISION ON CHILDREN EXAMINED

Sofia BULGARSKI ZHURNALIST in Bulgarian No 7, 1981 pp 14-19

[Article by Khristo Bonev: "Children and Television"]

[Text] At this point it would be hardly possible to imagine life without television. To an even greater extent this applies to the modern child, for whom it becomes an element of the household environment from the time of his birth. From the very beginning the child is impressed by the set from which come the changing images on the small screen. From that time on the set becomes the child's toy. The child tries to reach it, stretches his hands, and learns from an early age how to turn it on and forgets to turn it off with increasing frequency.

No one would seriously argue the point that today children play less wherever TV is present. Studies made by the former Scientific Research Institute of Radio and Television and by the Scientific-Information Center of the Committee on Culture show that the favorite occupation of children in their leisure time is to watch television: 30.3 percent, compared to 5.4 percent of the time spent in games.

However, children do not look at children's television alone: 25.1 percent of children between the first and the fourth grades and 55.7 percent of children between the fifth and eighth grades watch adult programs as well. Naturally, these percentages are relative, for they are largely the result of the intervention and the restrictions of the parents, without which even more television would have been watched.

A certain trend is developing: as the children grow, interest in television declines. Whereas in the case of the adults, it is becoming a secondary activity to an increasing extent, it is the primary one for the child. For this reason, television replaces a number of other activities which are important in terms of the child's comprehensive and harmonious development.

"Television Boom"

There is hardly any other method which could supply the child with such extensive information on the unknown world as television. Today children acquire a greater knowledge of the world at an early age thanks precisely to TV. Within the system of social and scientific progress, television is developing on a parallel basis with all other scientific and technical achievements. However, its phenomenal nature gained its exceptional importance as a result of its penetration into home life, which it changed considerably.

In the 1970's it was said that the "information flood" would drown the world and that receiving and selecting would become impossible. Examples were given of the repeated doubling of knowledge as a result of the scientific and technical revolution. Whereas mankind's knowledge doubled between 1900 and 1950, compared with the preceding 300 years, today the doubling takes far less time: 7 years in chemistry, 5 years in electronics, and so on.[1] New information is born every second. Every 25 seconds an article containing new information is being written.[2] This both real and mythical information information flow can reach man only thanks to media which make use of electronics.

Two directions, related to the development of television and its social consequences, became apparent in the electronic escalation in the West. The first was the optimistic one, which supported television. It considered the world entirely through the small screen. According to it the future cultural development of mankind would be possible above all through television. A variety of experiments were undertaken on so-called "educational television," which could change the educational process both at school and at home. School curricula were reorganized in order to be synchronized with television programs. Experimental schools, classrooms and laboratories were set up. The production of cassettes with an educational content rose incredibly. Naturally, this "television-educational boom" was encouraged by the industrial complex for purely financial reasons. Even the studies which were being made were aimed in support of this campaign. Thus, for example, with the help of laboratory studies K. Steifenbach proved that a person memorizes 10 percent of what he reads, 20 percent of what he hears, 30 percent of what he sees and 50 percent of what he sees and hears simultaneously.[3] Marshall McLuhan enthusiastically claimed that television is the means through which man will mainly communicate in the future, turning television into one big village.[4] The second, the pessimistic, also absolutized the power of television. However, it believed that as early as the 1980's it will bring mankind into a state of social loneliness and social atrophy. Everyone would be alone and communicating only with television systems, deforming or abandoning many other activities inherent to man. In this state of hopelessness, according to Richard Diel, mankind will seek a new yet very old type of communication: conversation between two people.[5]

However, the 1970's passed and we are entering the 1980's. The hopes assigned to the educational tendency did not come true to the expected extent.[6] A decentralization of cultural processes which television was unable to limit or encompass appeared. Communications among human beings defeated the television aggression. The "information crisis" went away. It turned out that by itself television cannot become the main structure-forming factor of human culture. Such behavioristic infatuation with the role of television based on the "stimulus-reaction" system relied on a mass awareness whose biopsychological mechanisms could be controlled from the panels of electronic machines.

The use of the real advantages of television fully synchronized with the social system is a truly difficult process. However, it can be carried out only in class-social conditions which are radically different from those of the bourgeois society, i.e., under the conditions of the socialist society, in which television and the other mass communication media are subordinated to the profoundly humane objective of building a developed socialist society and molding a comprehensively and harmoniously developed individual.[7]

Arguments "For" and "Against"

It is true that television has comprehensively taken the place of fairytales and stories. In this sense it has limited communications between parent and child, considerably reducing it to an instrumental communication. This is developing into a lifestyle. The busy parents are increasingly dedicating less time to their children. This time is particularly necessary for communicating in the course of which social experience and knowledge of life are shared and the imagination and emotions are enriched. Compared with the parents' potential for doing this, television offers far greater possibilities. The information provided by the mass media is basic to modern man. Studies have indicated that only 5 percent of all information comes from interpersonal contacts. The advantage of television, consequently, is natural. However, reducing the possibility of communicating with the parents leads to losses which cannot be detected immediately. In listening to the stories of his parents, the child acquires a view of the world which is different from that of others and the words themselves enable him to develop his own profoundly individual feeling. The child has the freedom of imagination which enables any child to develop his own world, based on profoundly intimate concepts and imagination, different from those of the other children. This makes the sensitivity of the child broader, more colorful and more active. Information provided by other sources further develops, corrects and, sometimes, even changes the concept created within the child's consciousness. Whereas in the case of television, along with the unquestionable wealth of information, from an early age the child is presented with visually accessible and prepared models. The child is given models of good, bad, beautiful, ugly, funny, sad, pleasant and fearsome. However, even this is not too bad. What is bad is that because of the mass nature of the medium, all children develop the same models. Concepts and the imagination become standardized. In inverse proportion to the possibilities offered by television, knowledge becomes restricted. The child begins to think the way the television thinks. From being a toy in the hands of the child, the television turns the child into a toy. This, however, has lasting and profound consequences. That is why it is no accident that T. Walter believes that children who wish to be distracted by television actually suppress their creative capability.[8] That is also why it is no accident that James Halloran, chairman of the UNESCO Mass Communications Commission, published the article "Attention--Television" in the periodical COURIER,[9] while in the newspaper NARODNA KULTURA Todor Petev published the article "Attention--Children in Front of the Television Set!"[10]

Unquestionably, if we followed this path of criticism, we would reach a pessimistic dead end. This would be the case if we studied the "children-television" ratio out of context of the social environment and the class-social structure of society and its objectives. We can analyze what television gives to us and takes away from us only in relation to society and, therefore, the content of television programs and after that in terms of interrelationships with the values of the parental circle, friends, schools and social organizations, i.e., the entire set of elements which socialize the child in terms of a specific society.

Studies have indicated that children share their impressions of television programs above all with their comrades or friends, followed by their parents, siblings, grandparents, i.e., the family circle and, finally, teachers. Impressions are not shared only by 4-5 percent of the children.

At the same time, the opposite process takes place: the children learn about interesting TV programs mainly from their friends, followed by their parents or other close family members and, finally, a very small percentage of them, from their teachers.

These results lead to several conclusions: first, that the interaction between television and children is not isolated from the social environment. This is due to the circumstance that the very content of television is a reflection of the environment, for which reason the connection takes place along a considerably broader system of "social environment-television-children-social environment." Second, the connection between television and the child takes place mainly on the level of friends, followed by the family and, considerably behind them, the school.

The influence of the environment is unquestionable. It energizes or holds back the viewing of television. Incentives and changes in terms of specific programs are a group event. The friendly circle comes first, for it most frequently energizes viewing, in terms of volume and content, whereas the family circle is most frequently restrictive, and in the majority of cases its restrictions are not accepted internally by the child. To the child the family circle means coercion. The parents direct children to watch mainly children's or educational programs. In terms of programs for adults, restrictions are imposed by force--by preventing the child from going near the television set. As they grow up, however, children are decreasingly interested in children's telecasts and prefer those for adults. Here is an example: 91 percent of all children from the first to the fourth grade watch children's telecasts, compared to 21.1 percent who watch adult programs. In the case of children from the fifth to the eighth grade, 74.9 percent watch children's programs as compared to 55.7 percent who also watch adult programs. Both, however, show a preference for serial features, followed by entertainment programs, plays, musical shows and so on.

This differentiation and change in the child's information interests are related, as we may see, to the child's age and social environment. Gradually, the child begins to select among the tremendous volume of television information. However, it is helped by television itself through the differentiation of programs and variations in their quality. Gradually, the time spent in watching television declines. Against the background of the television the child begins to engage in other activities such as eating, playing, looking at books and, later, even studying. In other words, viewing becomes a secondary activity which is carried out on a parallel basis with a primary one. The child develops a selective mechanism which, against the background of television information, is "turned on" and "turned off" only in the case telecasts whose code (such as interest, curiosity) triggers this mechanism. This mechanism steadily improves and begins to operate on several levels. The child may be watching, i.e., on the surface the mechanism may be turned on, while remaining switched off internally. Such information is not retained by the "information storage area" of the mind. Initially a contact has been established, but the circuit has not been closed. The child selects and retains only specific programs and specific information.

The counteradaptation begins in the course of this consecutive order of adaptation to the information medium. In the course of this dialectically and naturally arrived-at way, the young and still mentally frail personality begins to turn into a social being.[11] It begins to differentiate and adapt not to just anything but to specific information models which carry specific ideas and artistic forms. At the same time, it begins to develop a critical attitude toward them by approving or rejecting them to the social field of friends, relatives or parents, or else reproducing them in games, at school, in kindergarten, on the street, in the park or at the playground (72.6 percent of children play games in which they identify with television characters). Indeed, although television has a tremendous socializing significance for the child, gradually, with age, its possibilities are reduced. The child discovers games, books, magazines, the radio, the tape recorder and the telephone at home. In the outside world he discovers the street, street traffic, the park, shop windows, streetcars, trains and airplanes. This is followed by the children's theater, motion pictures and organized entertainments such as kindergarten, school, public organizations, circles and rehearsals, with which also begin obligations and requirements and, with them, the establishment of a necessary regimen at home and restrictions concerning television viewing.

It is thus that, while it both enriches and limits the child, television is an equally important factor for the socialization of the child, side by side with the family, the school, friends, artistic culture and other mass communication media.

Television and the World Around Us

One of the characteristic features of television is that it reaches every home. Newsreels, feature films or documentary programs are accepted to one extent or another as knowledge and experience of the world and its phenomena inside the home. Naturally, this takes different forms of experience on the part of the child, based on the content and depth of his feelings. The knowledge which the child acquires through television, particularly as a social experience, of the various tangible areas takes place mainly through emotions. It is through them that awareness of specific events, processes and areas is largely molded.[12] These emotional experiences become the manifestation of the significance of phenomena reflected by television. Even a cognitive disharmony which is triggered in the child in connection with some programs lies, above all, in the area of emotions. This means that different children have different value attitudes toward the phenomena.

The reflection of a given object, phenomenon, or process may be projected in the mind accurately, i.e., objectively. However, the emotions related to its perception are subjective and different for each child.[13] Despite the mass nature of information and programs, they cannot be accepted adequately by all, for which reason the children retain their individuality. In this sense the children's audience shows a heterogeneous attitude toward the same broadcast described by us as a mass program. This means that some emotions are different from the expectations of the communicating agent. In other words, some programs with socially significant ideas and expected reactions cross with the ideas and real reactions of the child as a result of the different depth, content and shape of emotions and of awareness. That is why the most effective television program is only the one which can trigger adequate emotions.

As we may see, the reflection of the same object varies from child to child. The characteristic feature of television, however, lies elsewhere. It is not only the different attitude toward the program as such, i.e., the ready-made informative or artistic product, but the specific nature of television as a medium which reflects the object and recreates it triggers a different reflection. However, this is accomplished in such a way as to trigger emotions which are not consistent with the object itself, as it is in reality, but with the reflected object in a guided and shaped attitude toward it. Subsequently, this attitude becomes an attitude toward social reality. In other words, whereas in the case of a direct connection between the object and the child we have a direct reflection, accompanied by respective emotions, in the case of television we have a reflection of a reflection in the course of which the child may experience different emotions.[14] Usually, this reflection is a direction and has a different attitude toward the world and toward reality. If this attitude agrees with the emotions triggered by reality, while providing an enriching and further developing value to the child, it becomes socially significant. If the reflection is stronger than the real world the child develops an attitude which can come only from television. The reflected object is not the same as it is in the real world. Sometimes it even is not to be found in it, for it has been made so specific as to be possible only within the framework of the television program. At that point, in the case of the child he acquires the so-called "television life" or "television world" which is not consistent with real life and the real world.

The opposite is quite frequently the case: television creates weak concepts and programs as reflections of the objective world. Emotions triggered by the real world are far greater and richer. At this point such telecasts have no influence on the child and fail to trigger his emotions.

Our television tries to help, through the reflections it provides, to create an atmosphere which will contribute to the more complete and richer perception of the real world and will interpret the emotions it triggers. In some cases, however, it is unable to carry out this assignment. At that point the child clashes with the environment which proves to be richer or poorer than the emotions created by television. In such a case television has a restraining, a limiting role in the life of the child. In the previous case the connection between television and child is, actually, an interaction between "social environment-television-children-social environment." Such are the real ties with television, which include a harmonious interaction and in the course of which television enriches and develops the young personality by helping it to become part of social life more actively.

When the harmony among the environment, television and the child is disturbed, the child develops the characteristics of a consumerist awareness and his emotions become largely limited to the world of television.

What is the television world? It claims to reflect our daily life, our reality. In the final account, however, it proves to be entirely different, in many cases an alien element which isolated the children by creating a social distance between it and them. It is precisely for this reason that they develop information consumerism. We reach such a situation when television does not realistically reflect but creates its own world, its own material area which clashes with the environment and with social needs.

This is frequently due to the circumstance that television creates a large number of programs which do not always maintain the necessary standard because of the "television conveyor belt." Quite frequently quantity and quality clash with the needs of society and of the child. In many cases such telecasts have an institutionalizing effect. They begin to shape in the child information needs limited to the possibilities of the medium. Such programs flood the child with information which not only deprives him of a considerable share of his time but does not develop in the child active knowledge and an active life stance.

Influence Mechanisms

Unquestionably, television has a great influence on children, more than on adults. This is caused not only by the external characteristics of the time used but, above all, as a result of the lack of social experience, of convictions developed by the child, of mental reactions inconsistent with the reflected object and the lack of a value system developed and accepted by the child. This influence, however, is not absolute. On the contrary, the laboratory and the field studies conducted by Soviet researcher Yu. Sherkovin prove that in their essential line the mass information media, including television, strengthen previously created concepts. To a lesser extent they accomplish minor changes and in extremely rare cases they contribute to a conversion, i.e., to a general change in an already established situation.[15] Regardless of this, this is largely not the case in children, for the very concepts developed by the child are unstable.

The daily total hour television watching creates a habit which is always related to a specific and recurring situational behavior. Let us take as an example the child's schedule at home. The time for watching television is controlled by the leisure time, regardless of the nature of the programs. Or else, it may be the result of the situation created by the television such as, for example, the "Good Night, Children" regular evening program or the specific children's telecasts every Saturday and Sunday. The habit, which is an almost automatic behavior, is countered by the expectation, i.e., the anticipatory idea of the telecast in the imagination of the child. However, whereas a habit is not an actualized behavior, the feeling of expectation is specific. Or else it is the result of a specific need which has already been triggered by that same telecast or by advance information regarding it. Thus, for example, children learn about specific telecasts which develop in them a feeling of expectation, based on the daily and weekly television schedules carried by the press, television itself and the radio, in the case of serials or special sections, i.e., telecasts which involve a periodical presentation. Furthermore, the information which shapes their expectations may "flow" along informal channels as well, such as friends, parents or teachers who occasionally help to actualize the expectation to a higher degree.

Whereas the habit is unrelated to a specific information and specific information remains on the level of a general feeling of satisfaction, expectation, triggered by the excitement of needs and the making of a decision, i.e., of a choice, represent, in fact, an ideal success of the broadcast, achieved in advance. The child begins to live with the expected idea of the telecast. Actually, it develops within itself a specific set of circumstances. It has already acquired an anticipatory attitude with a value assessment regarding the program.[16]

Under such circumstances the expectation is either confirmed or rejected. In the former case we are faced with a psychological condition of satisfaction, which creates a feeling of balance in the child and a state of harmony or comfort. In the latter, a mental situation of dissatisfaction is created, i.e., of disharmony and confusion. On the sociological level, under such circumstances we are faced with a condition of social consistency and integration as distinct from a condition of social conflict and alienation. However, when a child develops a negative set of mind and a negative expectation regarding a specific program, which, unlike the anticipated information, turns out to be harmonious, the result is a state of satisfaction which exceeds the expectation.

Unlike adults, who show a more strongly expressed selective behavior concerning a specific type of information, more frequently the children compromise on the basis of the entertainment effect of the program. Thus, for example, a number of studies conducted by Lazarsfeld helped to establish that people show a preference for programs which agree with their own concepts and expectations.[17] For example, the experiments related to smoking helped to establish that information against smoking was accepted and had an impact not on smoker but on nonsmokers. This confirms Sherkovin's thesis, according to which the information provided by the mass media more frequently asserts rather than changes or rejects preestablished viewpoints. In the case of children, however, who have still not developed such stable concepts, the impact of television is far stronger.

Another important element of the influence is the opportunity for identification. This represents the opportunity for the child to adopt one of the positions or ideas supported by information telecasts, such as "for" or "against" arguments or, in the case of feature programs, to identify with one of the characters, who are usually presented as opposites. In this case the level of such programs, the power of the arguments and the artistry of the images are important. Through such identification television develops in the child his own preliminary positions and ideas, the more so if the program meets his expectations. It is thus that through identification television indirectly becomes a very effective and influential factor of the reference group which confirms, amends, enriches or entirely changes the child's preliminary concepts. Eventually, the reference group in television "meets" through the information supplied the concepts of the various groups within the social environment (friends, parents, fellow students, teachers and so on), which groups are of great importance in molding the child's concepts; second, it faces the genetically coded and transmitted social information in the child, inherited from previous generations. It is in a latent condition in the child and, depending on the actualized new social information, it may be provoked, awakened, amended or developed.

Television and the Creative Principle

The energizing of the creative principle through television is related to two concepts: "education" or "revelation" of the child's creative potential. Whereas the former has a certain educational effect, with a potential delayed influence, the latter is related to the overall behavior of the child and has a direct or indirect impact. This begins from the selective moment of viewing as a result of a decision and, therefore, it is moved to the social environment as a behavioral feature.

This distinction may be related to children-viewers as a group with its own sociopsychological characteristics. We distinguish between two groups: "children's public" and "children's audience." In practice, these two concepts are frequently confused and we speak of public or audience as though they were the same. However, a "children's audience" is that share of the children who have a contact with television shown as a lasting, selective and firm attitude toward its programs and transmissions. Unlike the "children's audience," the "children's public" establishes its relationship on a random, spontaneous, nonselective and blanket acceptance basis.[18]

In turn, this division into audience and public is related to the type of activeness shown. We distinguish between two different types of activeness based on the strength of the ties between the displayed activeness in the viewing of a program and activeness in social life (within the possible parameters of the child), as follows:

The first type is the real activeness.[19] In this case we have a high level of communication and substantiation between informational and social activity. The viewing of television is a cause-and-effect process based on the "social environment-children-television" system. Television viewing is a consequence of a specific social activeness, after which the viewing becomes a cause, while activeness which is the result of acquired experience, knowledge and emotions triggered by television becomes the effect. The activeness shown by the child at school and relations with other children, parents and teachers in the course of the development of artistic skills, the creation of labor habits, organized and unorganized games, entry into social-collective life and so on, trigger the child's need for informative and fictionalized television programs. Naturally, in this case the ties are polyvariant, and sometimes comprehensive and indirect. Since social activeness is not manifested as a "block," different children may be more or less active in one area at the expense of another.

In order for the child to become really active, he needs a creative climate and a creative environment. As a whole, our society offers such opportunities which have been greatly intensified in recent years and have penetrated all social areas and developed as a sociopsychological environment encouraging the manifestation of the child's creativity. Unquestionably, however, the creation of an overall social environment is not an automatic process without difficulties or deformations. For example, it is still demanded of the children that they have excellent marks in all subjects. This is entirely contradictory to the development of the individual qualities and potential of the child. This creates grounds for the development of an obsession with grades and for conformism, both of which are fully the opposite of a creative approach to the child. Quite interesting textbooks which entice the child to accept them esthetically repel the child not only at school but at home because of the requirement for additional learning, as a result of which the child looks for other opportunities for esthetic activeness. Such activeness, as a satisfaction, pleasure, emotion and manifestation, i.e., as a creative act, may be found within every child and must be acted upon. Unless society offers the child the possibility for realizing himself in a positive and useful activity, on the macro- and micro-levels, the child will do this in a reality which would be of no significance to society. This will lead to a loss related, above all, to the child's potential.

As we follow this path of development we reach the second type of activeness--that of the consumer. In this case we have a high level of information activeness and a low level of social activeness. In this case the viewing of television is of a compensatory nature, for the child is given a lesser opportunity to realize his potential in the social environment (differentiated), and expresses himself in television watching. This illusory expression is achieved through identification with characters who possess the qualities which the child would like to have. By identifying himself with these characters, the child imagines that he "can" accomplish something, that he is "able" to do something. Naturally, the child is not aware of this condition, nor are those around him. Left to his own devices, the child acquires a deformed understanding of this self-expression; the characters themselves, and their qualities, meanwhile, occasionally lack the necessary social significance.

Essentially, the viewing of television in this case is a condition of reaction, i.e., of a reflective activeness in terms of the medium. It is consistent with the behaviorist system of "stimulus-response," which is indifferent to the social environment, the possibility of self-expression within it and the needs which trigger it. Within this cycle the "television-children" interrelationship remains isolated from social needs. It is reproduced within a closed circle of trigger and expectation. The child becomes a "prisoner" of the television screen. The information he receives from the television does not energize or encourage him socially to express himself in the social environment. Because of the socially passive attitude of the child, this type of activeness offers the possibility of the child's standardization, for the creative process has been interrupted. Television cannot energize the child's creativity. In other words, television standardizes through its programs children who are more likely to be passive in their social environment.

Unlike a reaction in the case of actual activeness, we are faced here with a broadening of the cycle and with its social reproduction. This type of activeness means pitting standardization against the still frail developing personality of the child. In this case we have a creative approach to activities. In such a case television acts as a stimulus in terms of the social environment. (Naturally, in this case the meaningful aspects of television information--informative and fiction--is important. We could not undertake a specific study without the necessary content analysis of such information.) With such an active type, television does actually change, develop and enrich both the child and social reality and, as a whole, enriches the social potential. This situation, then, offers the possibility of establishing a creative link between television and children. In other words, television brings up and energizes the creative principle in children who express themselves more frequently and more actively in their social environment.

The development of the creative principle is related to the functions which television performs. The most active are the cognitive, educational, informative and entertainment functions. As a purposeful activity such functions are of a positive significance. As a social result, however, we may single out two diametrically different functions. The first is the creative, the one which awakens and which restores the artistry of the child; the other is the stereotyping, the standardizing, which standardizes, turns into cliches, restricts and suppresses the artistic base of the child. These two functions are largely related to the understanding of the television "code." For example, children with lower social activeness more frequently lack "code readiness" or the artistic cognitive readiness, for which reason they are more frequently under the influence of the stereotyping television function.

Knowledge of the television code, differentiated in accordance with the various types of telecasts and programs, means that the child is being influenced by the creative function. However, this is not to say that this function energizes exclusively the artistic manifestations of the child related to the artistic principle. It means that it brings out the creative principle as a viewpoint, as a means of thinking and acting in social life.

Let us point out in conclusion that television does not restrict, but expands, the child's outlook and thinking capacity. It enriches the feelings, emotions and imagination of the child and stimulates the creative principle. It counters conservative thinking and stereotyped emotions as a result of its potential for expanding the knowledge and enriching the emotions of the child.

FOOTNOTES

1. According to the periodical ZW-ZW, No 39/40, 1975, pp 1572-1576.

2. Ibid.

3. Ibid.

4. McLuhan, M. "Understanding Media. The Extensions of Man," New York, 1964, p 186.

5. R. Diel, "Television in the 1980's. File of the Scientific-Information Center for Culture.

6. D. Halloran, "Attention, Television!" SOTSIOLOGICHESKI PREGLED, No 3, 1979, p 5.

7. Program of the Bulgarian Communist Party, Sofia, 1971, p 91.

8. Anthology "Budushcheye Chelovecheskogo Obshechestva" [The Future of Human Society], Moscow, 1971, p 301.

9. D. Halloran, op. cit.

10. T. Petev, "Attention: Children at the Television!" NARODNA KULTURA, No 24, 1978.

11. T. Shibutani, "Sotsial'naya Psikhologiya" [Social Psychology], Sofia, 1969, p 385.

12. G. Pir'ov, "Pedagogicheska Psikhologiya" [Educational Psychology], Sofia, 1966, p 314.

13. A. N. Leontiyev, "Deyatel'nost', Soznaniye, Lichnost'" [Activity, Awareness, Personality], Moscow, 1975, p 55.

14. E. Nikolov, "On the Dissemination of Cultural Values and on Its Nature and Problems." IZVESTIYA NA NAUCHNOIZSLEDOVATELSKIYA INSTITUT PO KULTURATA, No 2, Sofia, 1979, p 13.

15. Yu. A. Sherkovin, "Psikhologicheskiye Problemy Massovykh Informatsionnykh Protsessov" [Psychological Problems of Mass Information Processes], Moscow, 1973, p 163.

16. V. M. Krachakhiya and Sh. A. Nadirachvili, "Tsennost' i Ustanovka. Problemy Sotsial'nykh Ustanovk. Sotsiologicheskiye Issledovaniya" [Value and Setting. Problems of Social Settings. Sociological Studies], Tbilisi, 1971, p 24.

17. P. Lazarsfeld and H. Menzel, "Massemedien und personaler, Einflus, Wn. Grundfragen der kommunikations fokschung" [Mass Media and Personality. Influence, Scientific Study of Fundamental Communications Problems], M., 1973, p 120.

18. Anthology "Sotsiologicheski Aspekti na Esteticheskoto Vuzpitanie" [Sociological Aspects of Esthetic Education], Sofia, 1980, p 189.

19. V. I. Kremyanskiy, "On the Study of the Concept of the Activeness of Material Systems," VOPROSY FILOSOFII, No 10, 1969, p 56.

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DESIGN, CONSTRUCTION OF NEW MINICOMPUTER DISCUSSED

Warsaw INFORMATYKA in Polish No 7-8, Jul-Aug 81 pp 23-24

[Article by Janusz Zalewski: "What Should the New Polish Minicomputer Be Like?"]

[Text] Participants in a four-hour seminar held on 24 April 1981 at the MERA-IMM [Automation and Measuring Apparatus Industry - Institute of Mathematical Machines] in Warsaw attempted to answer this question. A group of specialists from the IMM, the University of Warsaw Institute of Information Science, and the MERA-System enterprises (working under the direction of Magister Engineer E. Jezierski-Ziemkiewicz) presented and discussed the preliminary concept for a minicomputer system, designated on a working basis as SOLID.

The purpose of the seminar, already prepared in the initial stage of the work on the system, was to:

--Inform the scientific community about SOLID's initial assumptions.

--Encourage the collaboration of other institutions (necessary to fully realize the project).

It should be mentioned that the project concerns a minicomputer that will be possible to introduce in a few years, let us say by 1985.

System architecture requirements were presented in the first two papers. Software and hardware operating requirements include:

--Adapting system configuration to user needs, creating various configurations--from the simplest structures, via a local network, to complex digital systems having large calculating powers.

--Permitting rapid production of software and, later on, its easy maintenance, and the complete transferability of software (user programs as well as operating systems).

--achieving satisfactory hardware and software reliability and simplicity of service.

The following requirements are economically based: guaranteeing the usefulness of partial project results at every stage of the project and avoiding limitations that would make it impossible to adapt to unforseen changes in component technologies and in the organization of computers. This could lead to the statement that the project should be open-ended at each stage of realization, permitting it to be adapted to current world trends or domestic capabilities.

It turns out that such sweeping requirements and the various projected applications (for example, to develop software and to control processes, and in graphic systems, telecommunications, didatic systems and data banks) impose very specific conditions from the design viewpoint. Leaving the detail explanations of the project authors, this article draws attention to only two things.

First, the designers intend to assure the required system flexibility by building a so-called multicomputer whose organization will have the attributes of a multiprocessor and multi-computer system (a more accurate formulation will have to be obtained from the designers because the meaning of the word "multicomputer" is not clear to me and some other seminar participants).

Second, all software must be in a high level structural language, which also tends to direct system architecture toward this language's configurative realization.

Not much can be said about the minicomputer's configurative realization because at this time it is difficult to determine all the details of the architecture and organization, even considering technological unknowns. However, for software, which will be based on the C language, it is just the opposite. Thus, the six subsequent papers were devoted to describing various aspects of system software, beginning with the very concept and outline of the operating system, through the characteristics of the system of files and system for producing translators, and ending with the C and C-code language itself. Although this language is not well known in Poland, it already has been verified on many different machines and is used to write the UNIX operating system (Bell Laboratories, Murray Hill, New Jersey, for PDP-11 computers) which with regard to functionality is superior to the original DEC operating systems.

The most important items of the entire project, those concerning its realization, were discussed in the final three papers. Because existing software for domestically produced minicomputers and computers used in Poland is far from perfect, the designers proposed, at a minimum, the development of software based on C, for example, for the MERA 400, at the same time the necessary design changes are introduced.

During the first stage it will be necessary to build equipment to produce software, especially graphic systems, From the moment an operating system and C translator are developed for one of the standard minicomputers used in Poland, work on a generator of translators can begin. The complete project (and thus the optimum program) can be realized by building a new minicomputer (the SOLID multicomputer) for which, however, expanded work on Poland's component base is essential (while knowingly relinquishing the importation of components), especially highly integrated circuits, including programmed matrices.

The designers realize that even if these conditions are met, satisfaction will be far from complete if simultaneously production of a wide assortment of peripheral equipment is not initiated, and if distribution, service, training, documentation and publication activities are not improved.

Users and designers took part in the discussions. Above all, the former emphasized the need to begin selling peripheral equipment and expanding their assortment, and the need to greatly improve their realibility and service.

On the other hand, the designers were concerned about basic technical problems, for example, guaranteeing the component base and investigating the possibility of co-production, and problems of the C language and software generators. It was decided that these would be considered in greater detail in future IMM seminars. Some designers voiced the need for an accurate diagnosis of the need for and results of computerization. It also was proposed that an efficient, simple minicomputer system be quickly developed which would be a remedy for some of the current weak points of life. Simplicity of service and quick construction are necessary conditions for such a system. It should be understood that the purpose of such a system is the desire to fill the gap between a complicated minicomputer and the possibility of significant improvements using simple calculation devices.

In summarizing the results of the seminar, it should be said that work on a new Polish minicomputer should begin with straightening out the mess in the realm of hardware, software, service and sales. If software incompatibility, deficiencies, lack of documentation and maintenance as great as presented, then work must certainly begin (coordinated!) on a software system based on a structural language. Whether this should be the C language will have to be determined by the specialists; I did not hear any dissenting voices at the seminar, however.

One cannot practically realize work on a new computer without possessing the proper equipment, moat of all graphic systems equipped with CRT monitors, plotters and the like. Without such systems and test equipment, domestic producers of large scale integrated circuits will have a very difficult task ahead of them. In turn, it also should be remembered that a proper level of domestic production of microprocessors, semiconductor memories and programmed matrices is a basic condition for efficient work on designing a new minicomputer system, and thus the fate of the entire project.

In addition, it should be remembered that this is a big project that requires perfect coordination. From the engineering viewpoint, the realization of this project is justified, but it is feared that its goal will not be achieved if the economic and organization methods used to date are employed. It seems that organizing the seminar was the first, though small, step for changing these methods.

11899
CSO: 2602/19

COMPUTER CENTERS, SYSTEMS DESCRIBED

ZETO Computer Centers Corporation

Warsaw POLISH TECHNICAL REVIEW in English No 1, Jan 81 brochure pp 1-4

[Text]

ZETO is a State organization established to render services in the sphere of informatics to State-owned and co-operative units in order to ensure the development of modern management instruments as an integral element of the economic development of the country.

ZETO offers a wide range of services including advisory and consulting services in the domain of informatics, designing of computer systems, programming, software and hardware service, work connected with data processing, as well as designing and construction of specialistic installation, air-conditioning, etc. for the needs of computer centers. Due to the wide range of activity and its large possibilities, ZETO is the main supplier of computer software to all sectors of the national economy and administration in Poland.

ZETO renders informatics services i.a. to such important branches of the economy as industry (41.7%), administration and finances (29.7%), agriculture and forestry (10.9%), trade (4.8%), transport and communications (4.6%).

Scientific and technical potential

GENERAL INFORMATION ABOUT ZETO's STRUCTURE AND RESOURCES:

● more than 6000 specialists, analysts, designers and programmers as well as technical and organizational personnel ● 16 independent ZETO enterprises rendering services over the whole territory of Poland ● 53 computer centers situated in large Polish towns ● 85 computers (ODRA, RIAD, IBM, ICL, DATAPOINT) ● experience in every domain of the national economy ● research-and-development center.

Specialists employed at ZETO have the necessary background and experience which enables them to solve new problems in many fields such as management, organization of production, engineering calculations, statistics, etc., as required by domestic and foreign users. About one third of the personnel are higher schools graduates. They have been working for at least three years in the given field of specialization and they have a good command of foreign languages (Russian, English, German or French).

One of the main products offered by ZETO is READY-MADE SOFTWARE i.e. fully manufactured systems developed by specialists employed in ZETO enterprises throughout Poland.

The library of standard software packages of the ZETO COMPUTER CENTERS CORPORATION includes more than 70 items; each of them has been introduced at 10 users at least, including foreign ones. ZETO offers to its customers finished products together with system installation and commissioning, personnel training, guarantee and full after-sale service in the range of software maintenance and development.

Here are examples of the most representative systems manufactured at ZETO:

RODAN	Generalized Data Base Management System--a system developed on the basis of reports of the Codasyl Committee DBTG 1971/DDLC 1973. The possibilities of these two reports have been extended by the RODAN designers who have introduced: --the Storage Structure Language --the Support Functions Processor --the End User's Language Generator RODAN is designed for fast making of universal or specialised systems whose functions, method of organization and processing control require data structures and techniques unobtainable by means of the traditional data processing technologies.
SYKON	Conversational Data Base Management System. SYKON is a tool which enables finding, processing and updating of information contained in the data bases both by conversational and batch processing techniques. SYKON belongs to the class of so-called self-contained systems and is designed to serve the formated data bases. The own physical structure of the SYKON data gives the user a flexibility of the logic of data structure and a rapid implementation of the searching process.
STEP	Techno-Economic Production Control System. STEP is a utility systems generator designed, first of all, for the introduction in industrial plants of computer production control systems (activity connected with planning, order control and goods-on-stock control in a plant, etc.). The system designs employed in the STEP enable speeding up three to five times the development of production control and planning utility systems.
SEMO	Stock Management System. SEMO serves to automate filing work connected with the utilization of materials in an industrial plant. Its range covers the recording of materials on stock and in circulation, as well as objects of short service life.
SYWIN	Information Retrieval and Report Generator. This system, basing on a description of the problem prepared by the user in the special JOWIW language, generates source programs in the PL/1 language which organizes information search and printing out.
REJESTR	Vehicles Recording System. REJESTR serves to automate the work connected with filing of vehicles within a region. It enables quick updating and reorganization of the filing system, searching of information and preparing of statements for the local administration, insurance, police and other organs according to appropriate input data. REJESTR is being introduced in the Transport Departments of Voivodship Boards.
SYMLEK	Automatic Cows Breeding Evaluation System. SYMLEK enables complete control of the cows breeding process in a given region and, consequently, rational breeding economy. The main functions of the system include current control of the utility rate of cows and an evaluation of the breeding value of the herd. The SYMLEK system has already been introduced in a majority of Voivodship Animal Breeding Stations.

READY-MADE SOFTWARE

Some systems have already been described. Here is an extended list of selected reproducible systems offered by the ZETO Computer Centers Corporation:

RODAN – Generalized Data Base Management System

SYKON – Conversational Data Base Management System

STEP – Production Techno-Economic Control System

SEMO – Stock Management System

SIGMA 2 – Computer Materials Economy System

RURY – Power Pipelines Strength Analysis System

AWIT – Text Information Automatic Retrieval System

SYWIN – Information Retrieval and Report Program Generator

MAKROCOBOL – Cobol Programs Generation System

REJESTR – Vehicles Recording System

KSERO – National Savings Clearing System

SYBAR – Computer System for the Archivization of Hospital Medical Examination Results

GAMMA – Automated Air Traffic Control System

SYMLEK – Automatic Cows Breeding Evaluation System.

TAILOR-MADE SOFTWARE DEVELOPMENT

In the case of particularly complicated systems requiring unique computer solutions, the ZETO undertakes the development of individual utility systems. ZETO ensures complex service, from problem analysis through software design to the introduction of the system and its after-installation service and development, till the system is taken over by the trained personnel of the user.

SOFTWARE SERVICE

ZETO ensures the maintenance and updating of the existing software, as well as specialised service and experts' opinions, preparatory work and testing.

COMPUTING POTENTIAL

ZETO can make use of the processing time of its own computers: ODRA, RIAD, IBM ICL and DATAPOINT, as well as prepare data and render other services connected with data processing.

DESIGNING AND EVALUATION OF EQUIPMENT CONFIGURATION AND SOFTWARE TECHNOLOGY, DESIGNING OF COMPUTER CENTERS

ZETO undertakes specialistic services in the range of manufacturing, organization and operation of computer centers. ZETO runs a specialised Design Office which designs computer centers and their organization, as well as processing technology, design and evaluation of new equipment configurations and software technologies for the existing centers.

ZETO also offers its services in the line of the organization and start-up of computer centers according to the customer's requirements, the production of specialised installations, air-conditioning, as well as standard and specialized computer centers.

TECHNICAL SERVICE

ZETO ensures guarantee and post-guarantee technical service, undertakes the running of consignment stores of spare parts, repair service, test starting and testing.

TRAINING

ZETO offers a full range of training services within the range of its functions, basing on its own training facilities – high-class lecturers, own training centers.

Our Special Offer
We offer you the services of our software and hardware specialists, a qualified staff capable of starting concrete jobs immediately. These specialists include the following:
--consultants --analysts --designers --programmers --technical staff

We can hire our specialists on a contract basis for a definite period of time or within the framework of an agreement which can be renewed every year. We suggest that you take advantage of the possibility of employing highly qualified personnel within a short period of time and in required numbers, with a possibility of exchanging them for other specialists as new ventures are being undertaken.

ZETO renders services in the line of informatics in every field
--fast --cheap --with guarantee

Many customers from Poland and from other countries have already made use of our services. We are also interested in joint ventures in which we would shave the expected profits with our partners.

ZETO Computer Centers Corporation reference list. Here are some of our customers:

Polish customers:
RODAN • Huta Katowice Steelworks • RCI CENPLAN • GUS Central Statistical Office, Warszawa • ZNB Academy of Economics, Wroclaw • MERA SYSTEM

SYKON • Managing Staff Training Centre, Warszawa • RSW "Para-Ksiazka-Ruch" Publishers, Warszawa • Academy of Social Sciences, Warszawa

STEP • PONAR Precision Machine Tools Factory, Pruszkow • AGROMET Agricultural Machinery Combine, Poznan • Cable Factory, Bydgoszcz • UNITRA-POLKOLOR TV Works, Piaseczno • Diesel Engines Factory, Andrychow • WSK Transport Equipement Factory, Kalisz

SIGMA 2 • Paper-Making Machinery Factory, Jelenia Gora • MERA-ELWRO, Wroclaw • Technical Equipment Works, Gliwice

SEMO • Petroleum Products Marketing Enterprise, Bydgoszcz • Soda Works, Janikow • Machinery and Equipment Factory, Znin

SEMO JS • Poultry Plant, Stawno • FORMET Automatic Presses Factory, Bydgoszcz

SYWIN • Transport Equipment Factory, Rzeszow • Car Equipment Factory, Praszka • PZL Standard Power Hydraulics Elements Combine HYDRAL, Wroclaw

AWIT • TEKOMA Research and Development Centre for the Fundamentals of Machine Technology and Design, Warszawa • Chemical Industry Economic Institute, Warszawa • Scientific, Technical and Economic Information Center, Warszawa

RURY • MEGADEX Designers and Suppliers of Power Plants • Warsaw Technical University, the Institute of Applied Mechanics

SYBAR • Military Medical Academy, Medical Radiology Department, Lodz
• Medical Academy, Clinical Hospital No 1, Lodz

KSERO • about 170 systems installed in the specialised branches of the PKO National Savings Bank throughout Poland (Bydgoszcz, Gdansk, Lodz, Wroclaw)

SYMLEK • implemented in the majority of Regional Animal Breeding Stations (Olsztyn, Warszawa).

Foreign Customers

--INTERFLUG Airlines --GAMMA Automatic Air Traffic Control System (Berlin-Schonefeld Airport)

--In cooperation with Penta Data Consultants, Ltd., Great Britain, the MCS6 Factory Management System has been developed for the Honeywell Level 6 computer.

--Lebediev Institute of Physics of the USSR Academy of Sciences, Moscow--SYKON Data Base Conversational Management System

--CHEMOPETROL SPOLANA Works at Neratovice, CSSR-RODAN Universal Data Base Management System.

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Data Teleprocessing Processor Software

Warsaw POLISH TECHNICAL REVIEW in English No 1, Jan 81 pp 18-20

[Article by Jozef Muszynski]

[Text]

The development of the function of equipment and services in the line of data teleprocessing has brought about a considerable demand for the computing capacity indispensable for the operation of teletransmission sub-systems.

One of the means of ensuring additional computational resources is to separate a certain computing capacity outside the central computer i.e. the so-called front-end processor designed for operation in teletransmission networks. In order to provide adequate facilities to this effect within the framework of the Unified Computer System, the Institute of Computer Automation and Measurement Systems, Wroclaw, has developed the EC 8371.01 Data Teletransmission Processor which has been already implemented in normal production at the Computer Automation and Measurement Systems Centre.

The Teletransmission Processor (PTD) is a peripheral device designed for operation in and control of communication links of teleprocessing networks. This is a special-purpose computer with five programme interruption levels executing a specialized instruction set (51 instructions).

PTD comprises the following five functional blocks:

- a control unit incorporating equipment for, among other things, the realization of the instruction set and interruptions,
- an operating store used for storing the control programme and data,
- a channel adapter connecting PTD with the centrol processor,
- a communication scanner controlling the operation of communication lines basing on the data fed by the control unit,
- a service block effecting the control of transmission line contact circuits.

Basic technical data:

Store capacity	16…256 kB
Number of transmission lines	up to 352
Transfer rate	50…38,000 b/s
Transfer modes	asynchronous, synchronous (BSC)

The teleprocessor PTD is controlled by a suitable control programme executing functions imposed on the data teleprocessor in a given application.

Teleprocessing software

The teleprocessing unit comprises the following components:

- technical software, i.e. a set of programmed control and debugging routines for teletransmission equipment,
- data teleprocessor software, i.e. control programmes and a package of auxiliary programmes,
- the OS/JS operating system comprising components utilizing the teletransmission sub-system for extending the functions and utilities of the operating system (e.g. the TSO time-sharing system), and also components making possible the utilization of I/O user's terminals in the programmes developed (methods of access to teletransmission equipment).

The PTD software set can be divided into two basic groups:

- functional software incorporating the PTD control programmes,
- auxiliary software used by the central computer incorporating updating and control programmes generating routines, data loading and the PTD operation initiating routines, and the PTD store content printout routines.

Control programmes are a key element of the PTD software, two basic versions of control programmes being foreseen for the PTD EC 8371.01 data teleprocessor:

EP/JS – an emulation control programme executing in PTD the emulation of functions of the EC 8402 technical multiplexer, i.e. character buffering level,

NCP/JS – a network controlling programme performing the functions of the face-end processor, i.e. the buffering of messages.

The EP/JS – emulation control programme

This emulation control programme makes possible the application of PTD in systems with software developed on the EC 8402 technical multiplexer. Besides the emulation function, the EP/JS also executes additional functions such as the monitoring of data transfer between the central computer and PTD and between PTD and communication links. This makes possible the extension of sub-system diagnostic services as well as the monitoring and reporting errors on communication links.

Using EP/JS it is also possible to control the operation of the sub-system from the PTD operator's control desk. As for the central computer, the application of the BTAM/JS or TCAM/JS access techniques is required for direct cooperation with the PTD teleprocessor equipped with the EP/JS emulation-type control programme. These access techniques involve the control of operation of each terminal connected to PTD, and each communication link requires the assignment of its own channel address for connection with the central processor (Fig. 1). Consequently, the EP/JS control programme reguires the use of a channel adapter connected to a multiplexer channel (adapter type AK1).

The EP/JS emulation programme services subscribers' points operating in the start-stop and synchronous BSC modes. The minimum store capacity required for the EP/JS emulation control programme is equal to 16 kB, the maximum number of lines serviced being 255.

Subscribers' points set controlled by the EP/JS programme comprises:

EC 8575 conversational keyboard terminal,

EC 7911/7917 remote-controlled group monitors,

EC 7915 remote-controlled independent monitor,

EC 8592 T-63 5-bit teleprinter,

DZM 180/57 conversational keyboard terminal.

The EP/JS programme also ensures the operation of commutation links by means of auto-callers.

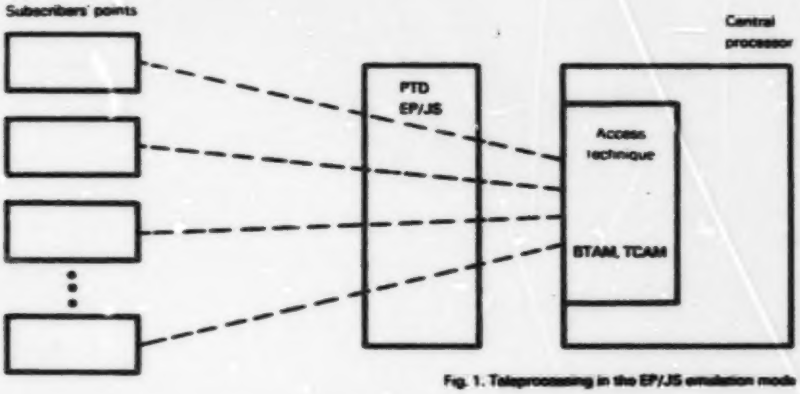

Fig. 1. Teleprocessing in the EP/JS emulation mode

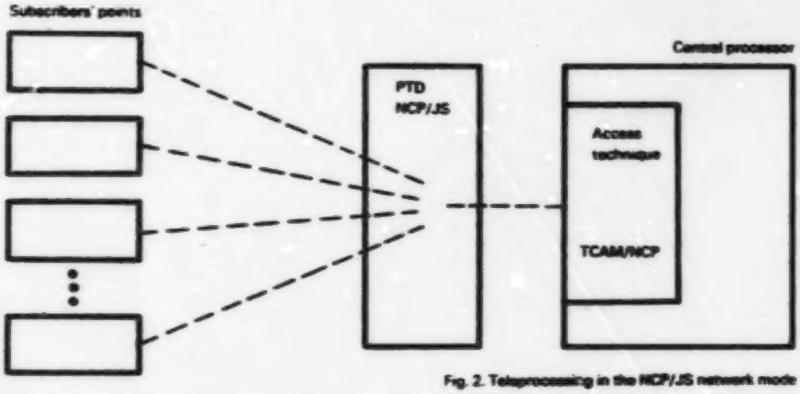

Fig. 2. Teleprocessing in the NCP/JS network mode

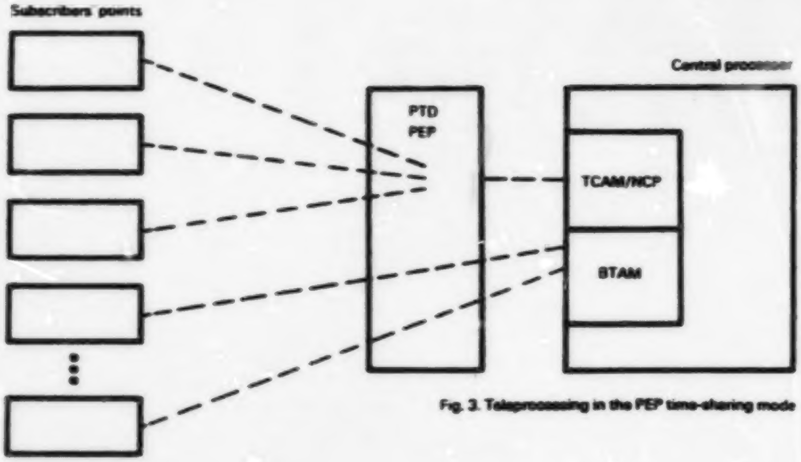

Fig. 3. Teleprocessing in the PEP time-sharing mode

Network Control Programme

The NCP/JS Network Control Programme utilizes fully the possibilities offered by the data teleprocessor in the line of servicing teletransmission links. It takes on some of the functions for the control of individual subscribers' points (realized by the access technique in the case of EP/JS). In addition to the functions performed by EP/JS (i.e. by the technical multiplexer), the NCP/JS programmer performs:

- the dynamic buffering of transmission blocks (messages),
- the addressing and selection of subscribers' points in multi-point lines,
- the removal of transmission control characters at line input and their subsequent shift at line output,
- the translation of line codes into a unified internal code of the central computer (DKOI) and vice versa,
- the servicing of multi – member conferences on multi – point lines, i.e. operation in a time-sharing network mode by the utilization of the communication link using terminals hooked up to multipoint lines,
- the accumulation and transfer of control restart records to the central computer so that the control programme can be restarted at any given time,
- the on-line testing of terminals coupled with the use of the access technique,
- time-sharing network operation mode i.e. a part of the line operates in the emulation mode and the other in time-sharing network mode.

Data transfer between the central computer and PTD equipped with the NCP control programme takes place through one data transfer channel, the message lines "end" in PTD and are not controlled directly by the access technique in the central computer (Fig. 2).

The form of the information exchanged between NCP and the access technique is unified and independent of the type of terminal from which the data are fed or for which they are destined.

To utilize NCP it is required that the TCAM/NCP version of the TCAM access technique ensuring suitable programme interface with the PTD data teleprocessor be used at the central computer end.

Operation in the time-sharing mode involves the simultaneous execution by the PTD of the NCP and EP functions (the so-called PEP mode), while also making possible the simultaneous operation with the TCAM/NCP and BTAM access techniques (Fig..3).

The NCP/JS control programme serves the needs of subscribers' points operating in the synchronous start-stop mode (BSC). The minimum operating PTD store capacity required for the NCP/JS programme is 48 kB, the maximum number of lines – 352 with a data transfer rate not higher than 2400 b/s. To increase the line data transfer rate it is required to reduce the number of lines (a technical limitation).

The PTD auxiliary software

The PTD EC 8371.01 auxiliary software comprises:

- programmed generation of control programmes,
- loading programme (routine),
- PTD store content dynamic printout programme,
- PTD store content independent printout programme.

Control programmes have a modular structure and are fitted to the configuration of the teletransmission network and to user's requirements during their generation stage. To describe the teletransmission network and options specified for a given installation, a special set of macro-instructions is used. The generation of control programmes takes place in several stages, depending on the kind of control programme, the PTD ASSEMBLER and a scheduler being used for that purpose. The loading routine is used for loading a given control programme module into the PTD teleprocessor store from a floppy disk set of the central computer. The PTD store content dynamic printout routine makes it possible to create a picture of a given section of the PTD store without interrupting the operation of the control programme. It is used generally for checking purposes (printout of data transfer tables). The PTD store content independent printout programme is used for obtaining the display of the entire content of the PTD store, the execution of the control programme being stopped. It is used most often in the case of faulty operation of the PTD data teleprocessor.

CSO: 2020/62

DECREE ON PROTECTIVE ZONES NEAR METEOROLOGICAL STATIONS

Bucharest BULETINUL OFICIAL in Romanian Part I No 59, 21 Aug 81 p 1

[Council of State Decree on the Establishment of Protective Zones around Platforms for Meteorological Observations]

[Text] The Council of State of the Socialist Republic of Romania decrees: Article 1--In order to ensure the proper quality of meteorological data which is recorded and measured on platforms for meteorological observations, a 30-meter wide protective zone is established around these platforms. This zone is not used for agriculture and the execution of any type of above-ground construction on the zone is prohibited.

The platform for meteorological observations is placed within or outside the constructable perimeters of the localities under conditions of representativeness and are executed in accordance with legally approved standard plans.

Article 2--The placement--at a distance of up to 500 meters outside the protective zone--of constructions higher than 1/6th the distance between the construction and the limits of the protective zone, of high tension and telecommunications systems, of units producing smoke and dust, and of sprinkler systems and the planting of forest belts will be carried out only with the approval of the National Council for Water Resources.

Article 3--The National Council for Water Resources, together with the executive committees of the peoples councils of the counties and of Bucharest Municipality, will establish the site plans for the placement of the meteorological stations and the meteorological observation platforms, marking off the respective protective zones.

Article 4--Council of Ministers Decision No 1677/1953 on the approval of the instructions regulating the establishment of protective zones around the platforms of the basic meteorological stations, published in COLECTIA DE HOTARIRI SI DISPOZITII ALE CONSILIULUI DE MINISTRI No 38 of 13 June 1953, is abrogated.

NICOLAE CEAUSESCU
President of the Socialist Republic of Romania

Bucharest, 19 Aug 81
No 230

CSO: 2702/28

END

JPRS 79079

28 September 1981

East Europe Report

SCIENTIFIC AFFAIRS

No. 716

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JPRS 79079

28 September 1981

EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 716

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BRIEFS

PRAGUE TROPICAL AGRICULTURE STUDIES--The Institute of Tropical and Subtropical Agriculture attached to the College of Agriculture in Prague-Suchdol celebrated its 20 years of existence on 11 September. Over 450 students from Europe, Asia, Africa and Latin America have graduated from the institute, and 29 of them have returned for postgraduate studies. Hundreds of Czechoslovak graduates have been involved in working on agricultural projects in developing countries, and 43 research studies, primarily concerning these countries, have been completed during the past 20 years. During the Sixth Five-Year Plan [1976-1980], about 350 Czechoslovak agricultural experts went to Africa, Latin America and Southeast Asia to participate in various agricultural projects and also to serve in the capacity of instructors and advisers. In 1980, 12 Czechoslovak veterinarians participated in a large cattle health recovery program in Angola, where the CSSR Government made available vaccines and laboratory equipment free of charge. In Laos, the possibility of large-scale hog breeding has been studied; Burma has asked for an expert on the cultivation of hops; Sudan has asked for food technology experts and Peru for an agricultural construction designer. Mexico, which intends to establish agricultural-industrial centers, has invited experts on agricultural products processing. During the past several years, Czechoslovak experts have trained agriculturists in poultry breeding, fodder processing and fishery in Algeria. [Prague ZEMEDELSKE NOVINY in Czech 12 Sep 81 pp 3, 8]

CSO: 2402/80

GERMAN DEMOCRATIC REPUBLIC

OVERVIEW OF 'DECENTRALIZED DATA TECHNOLOGY' PRODUCT OFFERINGS

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 17 No 9, Sep 80 pp 7-10

/Article by Dr Werner Schulze, VEB Robotron Marketing, East Berlin: "Basic Concept of the 'Decentralized Data Technology' Product Program." More detailed descriptions of these products and their operating systems are published elsewhere in this same JPRS issue/

/Text/ The "Decentralized Data Technology" product program is composed of coordinated individual units, complex units, and application complexes for the acquisition, storage, transmission, preparation, and processing of data. Complex units and application complexes have their own control and processing capability to various degrees (based on microcomputers) and include system-documentation components.

An essential characteristic of the "Decentralized Data Technology" product program is its modular design, which is based on

a uniform technical base (including the microcomputers utilized)

a uniform design and format (uniform basic design)

standardization and compatibility of the data media utilized

programmability at several control levels

modular operating systems.

The design provides overall standardization in the total product program. The utilization and application of the same basic technical solutions and logical-functional basic principles offers the user the advantages of good configurability and adaptability to specific problems. Furthermore, these features lead to simplified development of system documentation.

1. Devices of the 'Decentralized Data Technology' Product Program and Their Applications

Tables 2 and 3 list the application complexes, complex devices, and the peripheral devices that are important for the user (external memories, I/O devices) of Series I of the product program, together with their essential characteristics. The control and processing capability required for application complexes and complex devices is formed from the modules of the microcomputer systems K 1520 and K 1600. Table 1 contains the modules utilized. Table 2 gives the control cores used in the individual terminal units.

Table 1: Microcomputer Modules From the Product Program 'Decentralized Data Technology'

Microcomputer System	Module	Technical Data
K 1520	Central computer unit K 2521	8 bit, n-MOS switching circuit 3 K byte PROM, 1 K Byte RAM
	Central computer unit K 2525	Like K 2521, 8 K byte PROM
	Central computer unit K 2526	Like K 2521, two processors, 1 K byte RAM
	Storage modules	RAM, PROM, ROM maximum addressible capacity: 64 K byte
K 1600		
-Microcomputer K 1620	Central processing unit K 2662	16 bit, n-MOS switching circuit
	Storage modules	Maximum addressible capacity: 64 K byte (32 K words)
-Microcomputer K 1630	Central processing unit K2663	16 bit, n-MOS switching circuit
	Storage management unit K 2061	
	Arithmetic processor K 2062	Like K 2663, special microprograms
	Storage modules	Maximum addressible capacity: 256 K byte (128 K words)

Lfd. Nr. 0	Gerätebezeichnung A	Chiffre B	Steuerkern (ZRE) C	Ausstattung (Peripherie) D	Systemunterlagen E	Anwendungsgebiete F
Bürocomputer						
1	Bürocomputer	A 5110	K 2526	siehe Tab. 4	Betriebssystem SIOS 1526	vorzugsweise für Buchungs- und Abrechnungsaufgaben, blattorientierte Datenerfassung, Minimaltextverarbeitung
2	Bürocomputer	A 5120	K 2526	siehe Tab. 4	Betriebssystem SIOS 1526	dialogorientierte Datenerfassung, Stapeldatenübertragung, einfache Buchung und Abrechnung, Minimaltextverarbeitung
3	Bürocomputer	A 5130	K 2526	siehe Tab. 4	Betriebssystem SIOS 1526	universell einsetzbar für Buchung, Fakturierung, Abrechnung, dialogorientierte Datenerfassung, Nebenbeitextverarbeitung, Konvertierung von Dateien zwischen verschiedenen Datenträgern
Datenerfassungsgeräte						
4	Belegleser	A 5210	K 2521	Kassettenmagnetband, Folienspeicher	problem-orientierte Standardsoftware	automatische Erfassung alphanumerischer Informationen von Belegen
5	Datensammelsystem	A 5220	K 2526	Datenstationen, Magnetbandgerät, DFÜ-Anschluß, Seriendrucker, Bildschirm	Betriebssystem SIOS 1526	Mehrplatzsystem zur Erfassung von Massendaten auf Magnetdatenträger
Daneben Einsatz spezialisierter Konfigurationen der Bürocomputer A 5110, A 5120 und A 5130						
Textsysteme						
6	Elektronisches Schreibsystem (Grundmodell)	A 5310	K 2526	Alphanumerische, numerische und Funktionstastatur, Folienspeicher, Seriendrucker, Bildschirm, DFÜ-Anschluß	Betriebssystem SIOS 1526 problemorientierte Programmpakete	Textbearbeitung, Dateiverwaltung
6a	Elektronisches Schreibsystem (erweitertes Modell)			zusätzlich: Minifolienspeicher, Drucker		Textbearbeitung, Textverarbeitung und Dateiverwaltung in vollem Umfang
Basisrechnersysteme						
7	Kommerzielles Basisrechnersystem	A 6401	K 1620	siehe Tab. 4	Betriebssystem MOOS 1600, LAOS 1600, problemorientierte Programmpakete	wissenschaftlich-technische und kommerzielle Datenverarbeitung im Solobetrieb oder in Kopplung mit EDVA
8	Kommerzielles Basisrechnersystem	A 6402	K 1630	siehe Tab. 4	wie A 6401	wie A 6401, jedoch entsprechend der höheren Leistungsfähigkeit
9	Terminalorientiertes Basisrechnersystem	A 6421	K 1620	wie A 6401	wie A 6401	wie 6401, 6402 – Nutzerkommunikation über eine Vielzahl von Terminals
10	Terminalorientiertes Basisrechnersystem	A 6422	K 1630	wie A 6402	wie A 6402	
11	Prozeßrechnersystem	A 6491	K 1620	siehe Tab. 4	wie A 6401	automatische Prozeßsteuerung, Labor- und Prüffeldautomatisierung, Echtzeitaufgaben im prozeßgekoppelten Betrieb mit unterschiedlichen Leistungsanforderungen
12	Prozeßrechnersystem	A 6492	K 1630			
Weitere problemorientierte Basisrechnersysteme befinden sich in Vorbereitung						

Lfd. Nr. O	Gerätebezeichnung A	Chiffre B	Steuerkern (ZRE) C	Ausstattung (Peripherie) D	Systemunterlagen E	Anwendungsgebiete F
Terminals und OEM-Erzeugnisse						
13	Mikrorechnerentwicklungssystem	A 5601	K 2521	Folienspeicher, Lochbandeinheit, Tastatur, Seriendrucker, Bildschirm	Betriebssystem MEOS	Programmentwicklung für das Mikrorechnersystem K 1520
14	Mikrorechnersystem	K 1520		Moduln (Baugruppen für OEM-Einsatz)		Grundlage für Finalerzeugnisse auf Mikrorechnerbasis
15	Mikrorechnersystem	K 1620		Moduln (Baugruppen für OEM-Einsatz)		
16	Mikrorechnersystem	K 1630		Moduln (Baugruppen für OEM-Einsatz)		
17	Konzentrator	K 8521	K 2521		fest programmiert	Übertragungs- und Leitungssteuerung, Nachrichtensteuerung, Netzsteuerung
18	Multiplexor	K 8523	K 2521			
19	Konzentrator	K 8561	K 1630		problemorientierte Standardprogramme	programmierte Übertragungs- und Leitungssteuerung, Nachrichtensteuerung, Netzsteuerung, Aufgaben der DFV
20	Multiplexor	K 8563	K 1630			
21	Bildschirm-ein-/ausgabegerät	K 8911	K 2521	Bildschirm, Tastatur, DFÜ-Anschluß	fest programmiert	Bedieneinheit, Dialogterminal für Nahverkehr
22	Bildschirmterminal	K 8912	K 2521	wie K 8911	fest programmiert	Dialogterminal für Fernverkehr
23	Datenstation	K 8913	k 2521	wie K 8911	fest programmiert	Einsatz in Datensammelsystemen
24	Platzreservierungsterminal	K 8927	K 2526	alphanumerische und Funktionstastatur, Bildschirm, Seriendrucker, Folienspeicher DFÜ-Anschluß	problemorientierte Standardprogramme	Bedienplatz für Reservierungsaufgaben in Fernverarbeitungssystemen), einschlägige Dialogverarbeitung
25	Universelles Bildschirmterminal	K 8931	K 2526	wie A 5120	Betriebssystem SIOS 1526 spezielle Applikationsprogramme	Dialog- und Stapelverarbeitung in Fernverarbeitungssystemen
26	Druckerterminal	K 8951	K 2526	Tastatur, Seriendrucker, DFÜ-Anschluß, Bildschirm		dezentrales Auslistgerät und blattorientiertes Eingabegerät

Table 2: Complex Devices and Application Complexes of the Product Program "Decentralized Data Technology"

Key:

O	Running Number
A	Device Designation
B	Symbol
C	Control Core (ZRE)
D	Equipment (Peripheral)
E	System Documentation
F	Application Areas

Office Computers

1A	Office computer
1D	See Table 4
1E	Operating System SIOS 1526
1F	Preferably for bookkeeping and billing tasks, page-oriented data acquisition, minimal text processing
2A	Office computer
2D	See Table 4
2E	Operating System SIOS 1526
2F	Conversational mode-oriented data acquisition, batch data transmission, simple bookkeeping and billing, minimal text processing
3A	Office computer
3D	See Table 4
3E	Operating System SIOS 1526
3F	Universally usable for bookkeeping, invoicing, billing, conversational mode-oriented data acquisition, ancillary test processing, conversion of files between various data media

Data Acquisition Devices

4A	Document reader
4D	Cassette tape, floppy disk
4E	Problem-oriented standard software
4F	Automatic acquisition of alphanumeric information from documents
5A	Data collection system
5D	Data stations, tape unit, remote data transmission connection, serial printer, display screen
5E	Operating System SIOS 1526
5F	Multi-station system for the acquisition of mass data on magnetic data media

Also utilization of specialized configurations of office computers A 5110, A 5120, and A 5130

Table 2 Key (continued)

Text Systems

6A	Electronic writing system (basic model)
6D	Alphanumeric, numeric, and function keyboard, floppy disk memory, serial printer, display screen, remote data transmission connection
6E	Operating system SIOS 1526, problem-oriented program packets
6F	Text processing, file management
6aA	Electronic writing system (expanded model
6aD	Additional: mini-floppy disk memory, printe.
6aF	Text processing, text editing and file management in full scope

Basic Computer Systems

7A	Commercial basic computer system
7D	See Table 4
7E	Operating system MOOS 1600, LAOS 1600, problem-oriented program packets
7F	Scientific-technical and commercial data processing in stand-alone operation or coupled with electronic data processing systems
8A	Commercial basic computer system
8D	See Table 4
8E	Like A 6401
8F	Like A 6401, but corresponding to higher power
9A	Terminal-oriented basic computer system
9D	Like A 6401
9E	Like A 6401
9F	Like 6401, 6402 - user communication through a number of terminals
10A	Terminal-oriented basic computer system
10D	Like A 6402
10E	Like A 6402
10F	Like 6401, 6402 - user communication through a number of terminals
11A	Process computer system
11D	See Table 4
11E	Like A 6401
11F	Automatic process control, laboratory and test field automation, real-time tasks in process-coupled operation with various power requirements

12A, D, E, F like 11A, D, E, F.

Further problem-oriented basic computer systems are in preparation

Table 2 Key (continued)

Terminals and OEM Products

13A	Microcomputer development system
13D	Floppy disk memory, paper tape unit, keyboard, serial printer, display screen
13E	Operating System MEOS
13F	Program development for the microcomputer system K 1520
14A	Microcomputer system
14D	Modules (modules for OEM use)
14F	Foundation for final products on a microcomputer basis
15A, D, and F	like 14A, D, and F
16A, D, and F	like 14A, D, and F
17A	Concentrator
17D	Fixed programming
17F	Transmission and line control, message control, network control
18A	Multiplexor
18D	and F like 17D and F
19A	Concentrator
19D	Problem-oriented standard programs
19F	Programmed transmission and line control, message control, network control, tasks of remote data processing
20A	Multiplexor
20D	and F like 19D and F
21A	Display screen input/output unit
21D	Display screen, keyboard, remote data transmission connection
21E	Fixed programming
21F	Operating unit, conversation mode terminal for local traffic
22A	Display screen terminal
22D	Like K 8911
22E	Fixed programming
22F	Conversational mode terminal for remote traffic
23A	Data station
23D	Like K 8911
23E	Fixed programming
23F	Use in data collection systems

Table 2 Key (continued)

24A	Space reservation terminal
24D	Alphanumeric and function keyboard, display screen, serial printer, floppy disk memory, remote data transmission connection
24E	Problem-oriented standard programs
24F	Operating station for reservation tasks in remote data processing systems, relevant interactive mode processing
25A	Universal display screen terminal
25D	Like A 5120
25E	Operating system SIOS 1526, special application programs
25F	Conversation mode and batch processing in remote processing systems
26A	Printer terminal
26D	Keyboard, serial printer, remote data transmission connection, display screen
26F	Decentralized listing unit and page-oriented input unit

The application complexes and complex devices can be arranged in groups, in dependence on their principal application area:

Office computers
Data acquisition devices
Text systems
Basic computer systems
Terminals and OEM products.

This product program also includes devices for the construction of subsystems for remote data processing (especially for computers of the ESER (Uniform System of Electronic Computer Technology)).

Such a subdivision can only give a rough orientation. It is very problemmatical precisely because of the strict modular character and overall programmability of the product program. Thus, text processing is implemented not only with the electronic text-processing system A 5310 but naturally also with the office computers A 5110, A 5120, and A 5130 or the basic computer systems A 6401 or A 6402 - appropriate system documentation and hardware equipment being presupposed. Precisely the office computers are interesting from this perspective, since they provide economical, job-related, autonomous units for integrated data and text processing. Small and medium businesses thus have novel possibilities for solving their information-processing problems. Table 2, in the column "Equipment" includes types of peripheral equipment, but Table 3 specifies the particular devices that are actually used in the product program, together with their essential parameters. Especially the basic computer systems exhibit a multiplicity of possible applications. Based on the K 1620 and K 1630 microcomputers, and based on various complements of peripheral devices and system documentation, computer systems are created which are adapted to the particular application:

commercial basic computer systems A 6401 and A 6402 (batch-oriented)

terminal-oriented basic computer systems A 6421 and A 6422 (transaction-oriented)

process computer systems A 6491 and A 6492.

It is expected that this assortment will be expanded with other problem-oriented basic computer systems.

The devices listed in Table 3 mainly involve products of the VEB Combine Robotron or other combines of the GDR. The remaining devices are procured from other CEMA countries in virtue of international cooperation. The technical preconditions for this were created with the joint work on the system of minicomputer technology.

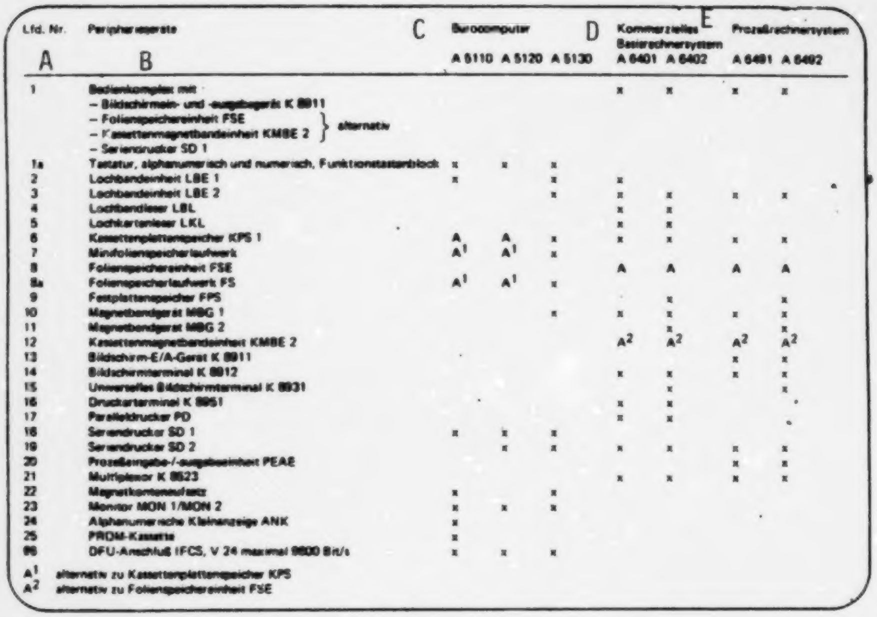
Table 3: External Memories and I/O Devices of the Product Program 'Decentralized Data Technology'

Running No.	Designation	Abbreviation	Technical Data
1	Cassette tape unit	KMBG	6/12 k bit/s
2	Cassette tape unit	KMBE 1	Two KMBG (for K 1520)
3	Cassette tape unit	KMBE 2	Two KMBG (for K 1600)
4	Tape unit 12.7 mm	MBG 1	10 k byte/s; 32 bit/mm
6	Fixed disk memory with connection control	FPS	35 M byte
7	Mini-floppy disk memory	MFS	About 100 K bytes unformatted, or about 80 K bytes formatted, 125 k bit/s
8	Mini-floppy disk unit	MFSE 1	Two MFS
9	Floppy disk	FS	3.2 M bit; 250 k bit/s
10	Floppy disk unit	FSE	Two FS with control device
11	Cassette disk memory	KPS 1	One fixed disk and one cassette disk; each 25 M bits
12	Punched card reader	LKL	600 cards per minute
13	Paper tape unit	LBE 1	-LBL: 350 characters/s 5...8 channels -LBS: 50 characters/s
14	Paper tape unit	LBE 2	LBL: 500/1000 characters/s; depending on reader type 1000/2000 characters/s; depending on reader type LBS: 50 characters/s
15	Paper tape reader	LBL	- 1500 characters/s, 5...8 channels
16	Serial printer	SD 1	- Character inventory: 96 35 characters/s -closed writing -132 characters per line or 210 characters per line
17	Serial printer	SD 2	-character inventory: 96 -400, 200, 100 characters/s -mosaic printer - 136 or 210 characters/line
18	Parallel printer	PD	-850 or 478 characters/min with 64 or 96 characters respectively -132 characters per line

Table 3 (continued)

Running No.	Designation	Abbreviation	Technical Data
19	Keyboard	AN 1	Keyboard for printer-oriented devices
20	Keyboard	AN 2	Keyboard for display screen-oriented data acquisition devices and sit-down work stations
21	Keyboard	NF	Combined and function keyboard primarily in combination with AN 1 and AN 2
22	Keyboard	ANF	Keyboard for display screen-oriented terminals
23	Display screen monitor	MON 1	31 cm screen diagonal 1024 characters, 16/24 lines, 64/80 characters/line character grid: 7 x 10 character inventory: 128
24	Display screen monitor	MON 2	31 cm screen diagonal 1920 characters, 24 lines, 80 characters per line character grid: 7 x 10/5x8
25	Alphanumeric mini-display	ANK	One block with 32 places - 64 characters
26	Process input/output device on a micro-computer basis	PEAE	Module assortment for analog and digital input/output, etc.

Table 4: Peripheral Devices (Basic Spectrum) for Office Computers and Basic Computer Systems



Lfd. Nr. A	Peripheriegeräte B	C Bürocomputer			D Kommerzielles Basisrechnersystem	E	Prozeßrechnersystem	
		A 5110	A 5120	A 5130	A 6401	A 6402	A 6491	A 6492
1	Bedienkomplex mit – Bildschirmein- und -ausgabegerät K 8911 – Folienspeichereinheit FSE } alternativ – Kassettenmagnetbandeinheit KMBE 2 } alternativ – Seriendrucker SD 1				x	x	x	x
1a	Tastatur, alphanumerisch und numerisch, Funktionstastenblock	x	x	x				
2	Lochbandeinheit LBE 1	x		x	x			
3	Lochbandeinheit LBE 2			x	x	x	x	x
4	Lochbandleser LBL				x	x		
5	Lochkartenleser LKL				x	x		
6	Kassettenplattenspeicher KPS 1	A	A	x	x	x	x	x
7	Minifolienspeicherlaufwerk	A^1	A^1	x				
8	Folienspeichereinheit FSE				A	A	A	A
8a	Folienspeicherlaufwerk FS	A^1	A^1	x				
9	Festplattenspeicher FPS					x		x
10	Magnetbandgerät MBG 1			x	x	x	x	x
11	Magnetbandgerät MBG 2					x		x
12	Kassettenmagnetbandeinheit KMBE 2				A^2	A^2	A^2	A^2
13	Bildschirm-E/A-Gerät K 8911						x	x
14	Bildschirmterminal K 8912				x	x	x	x
15	Universelles Bildschirmterminal K 8931					x		x
16	Druckerterminal K 8951				x	x		
17	Paralleldrucker PD				x	x		
18	Seriendrucker SD 1	x	x	x				
19	Seriendrucker SD 2		x	x	x	x	x	x
20	Prozeßeingabe-/-ausgabeeinheit PEAE						x	x
21	Multiplexor K 8523				x	x	x	x
22	Magnetkontenzusatz	x		x				
23	Monitor MON 1/MON 2	x	x	x				
24	Alphanumerische Kleinanzeige ANK	x						
25	PROM-Kassette	x						
26	DFÜ-Anschluß IFCS, V 24 maximal 9600 Bit/s	x	x	x				

A^1 alternativ zu Kassettenplattenspeicher KPS
A^2 alternativ zu Folienspeichereinheit FSE

Key:
A Running Number
B Peripheral Devices
C Office Computers
D Commercial Basic Computer System
E Process Computer System
1 Operator complex with
- display screen input and output unit K 8911
- floppy disk unit FSE {alternative
- cassette tape unit KMBE 2 {alternative
- serial printer SD 1

1a Keyboard, alphanumeric and numeric, function key block
2 Paper tape unit LBE 1
3 Paper tape unit LBE 2
4 Paper tape reader LBL
5 Card reader LKL
6 Cassette disk memory KPS 1
7 Mini-floppy disk drive
8 Floppy disk unit FSE
8a Floppy disk drive FS
9 Fixed disk memory FPS
10 Tape unit MBG 1
11 Tape unit MBG 2
12 Cassette tape unit KMBE 2
13 Display screen I/O unit K 8911
14 Display screen terminal K 8912
15 Universal display screen terminal K 8931
16 Printer terminal K 8951
17 Parallel printer PD
18 Serial printer SD 1
19 Serial printer SD 2
20 Process input/output unit PEAE
21 Multiplexor K 8523
22 Magnetic ledger card supplement
23 Monitor MON 1/MON 2
24 Alphanumeric mini-display ANK
25 PROM cassette
26 Remote data transmission connection IFCS, V 24 maximum 9600 bit/s

A^1 Alternative to cassette disk memory KPS
A^2 Alternative to floppy disk unit FSE

PHOTO CAPTIONS

1. p 7. Office Computer A 5110 With Magnetic Ledger-Card Attachment
2. p 9. Office Computer A 5110 With Display Screen and Floppy Disk
3. p 10. Office Computer A 5120
4. p 10. Office Computer A 5130
5. p 10. Space-Saving Terminal K 8927

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COMMERCIAL BASIC COMPUTER SYSTEMS ROBOTRON A 6401, A 6402 DESCRIBED

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in Germn Vol 17 No 9, Sep 80 pp 11-14

/Article by Manfred Gruenewald, VEB Robotron Center for Research and Technology, Dresden: "Commercial Basic Computer Systems Robotron A 6401 and A 6402"/

/Text/ The basic computer systems A 6401 and A 6402 are special application-related configurations of the microcomputer system K 1600. The different configuration possibilities of the microcomputer system K 1600 make it possible to furnish basic computer systems for various tasks.

The microcomputer system K 1600 with the microcomputers K 1620 and K 1630, which are constructed on the basis of modern, highly integrated n-MOS microprocessor circuits, is a component of Series II of the uniform system of minicomputers (SKR) with the Model No. CM 50/50-2.

The technical advantages of the new system are its great compactness, low cost, high reliability, and functional universality.

The new microcomputer system is oriented towards very broad application. Besides its use as a commercial basic computer system A 6401 and A 6402, it can be used

in the area of automatic production control

in laboratory and test-panel automation

in large remote data processing systems for controlling data channels and terminals as well as for line-concentrator functions

as terminal-oriented basic computer system

for other control functions, etc.

1. Capabilities of the Microcomputers K 1620 and K 1630

The basis for the multiple capabilities is

the uniform, modular structure of all system components

a broad performance and price variation of the system components with respect to processing power, connection possibilities, memory equipment, and system performance

the constructive design which makes it possible to install modules into the standard vessels of the "uniform vessel system" (EGS) and into vessels corresponding to the CEMA standard as well as to build up complete computers

the programming and connection compatibility to the SKR

the expansion capability of the modules.

The general system architecture of the microcomputer system K 1600 (Figure 1) provides for all the system components (processor, memory modules, connection controls, and coupling units) being connected through a common bus. All the functional units of the computer communicate with one another over this common bus, the system bus K 1600. Besides the system bus K 1600, the computer also has the SKR unit bus and the processor-internal bus K 1630. The SKR unit bus guarantees the connection of peripheral units and connection control units with the SKR unit bus interface through a bus converter.

The processor-internal bus K 1630 is used to connect an additional arithmetic processor to the K 1630.

The microcomputer K 1620 is a model of the medium power class. It is intended as a built-in computer for work as an integrated problem-oriented computer in technical installations, e.g. for tool-machine control, or as an independent complete computer to solve universal control and information-processing problems.

The K 1620 differs from the more powerful model K 1630 primarily by its smaller addressing area of 32 K words (K 1630 - 128 K words) and by a computing power that is less by 20 to 25 percent.

Table 1 shows the common features and differences of the two computer models.

An essential characteristic of the K 1630 consists in its being upgraded with an arithmetic processor. This allows the rapid processing of 32/64-bit floating point numbers and of 16/32-bit fixed point numbers.

Table 1: Performance Parameters of the Computers K 1620, K 1630, K 1630 (With Arithmetic Processor)

	K 1620	K 1630 (Without Arithmetic Processor)	K 1630 (With Arithmetic Processor)
Processing width	16 bit parallel, word/byte processing		Fixed point: 16 and 32 bit Floating point: 32 and 64 bit
Number representation	Fixed point, two's complement		
Number of instructions	about 400	about 400	about 400 + 30 more basic instructions
Instruction system	SKR basic instruction system with supplements		
Control principle	Microprogram control		
Addressing types	12	12	12 + 8
Number of universal registers	8	8 (for user-) + 8 (for system-programs)	An additional 9 of these 4 can be freely selected by the programmer
Addressing Areas	32 K words, of these 28 for memory, 4 for I/O device registers	128 K words, of these 124 for memory, 4 for I/O device registers	
I/O organization	Interrogation, interrupt, or DMA traffic		

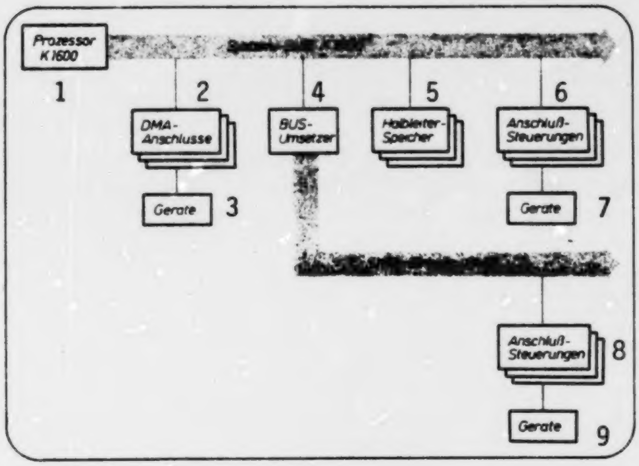
Prozessor K 1600
1
2
DMA-Anschlusse
3
Gerate
4
BUS-Umsetzer
5
Halbleiter-Speicher
6
Anschluß-Steuerungen
7
Gerate
8
Anschluß-Steuerungen
9
Gerate

Figure 1: Architecture of the Microcomputer System Robotron K 1600
Key:
1. Processor K 1600
2. DMA connections
3. Devices
4. Bus converter
5. Semiconductor memory
6. Connection controls
7. Devices
8. Connection controls
9. Devices

The microcomputer system K 1600 uses various storage modules based on semiconductor circuits. These involve

programmable read-only memories (PROM)
random access memories (RAM)

where the latter are primarily used in the system K 1600.

The capacity of the PROMs is 8 K words, and that of the RAMs is 2, 32, and 128 K words.

A reduction is possible in steps of 2 K with the 8-K PROM, and steps of 4 K with the 32-K RAM, and in steps of 16 K with the 128-K RAM.

2. Configuration Possibilities of the Commercial Basic Computer Systems Robotron A 6401 and A 6402

The possible applications result from

- the variable storage capacity up to 28 K words (with the Model A 6401) and up to 128 K words (with the Model A 6402)
- the large number of connectable different peripheral devices
- the possibility of autonomous use as well as use as an "intelligent" terminal with an ESER (uniform electronic data processing system) computer, where again it is generally possible to connect terminals to the basic computer systems
- the provision of a powerful operating system and problem-oriented system documentation.

In principle, an installation (Figure 2) includes the operating unit, which consists of a display screen with an alphanumeric keyboard, a decimal and function keyboard, to which a serial printer is generally connected. A data-media input/output unit (cassette unit, paper tape reader, or floppy disk drive) is likewise required.

This equipment allows a new operating concept such as also exists e.g. with larger electronic data processing systems, namely the concentration of operator activity on the display screen. Working with the display screen offers the following advantages:

- a faster working mode as compared to the typewriter because of the faster reaction of the system and the possibility of faster reaction on the part of the operator
- improved an simplified operator guidance
- noiseless work
- more trouble-free operation
- better and simpler tests.

If desired, a printer can be connected in parallel with the work on the display screen in order to produce permanent records.

Besides the products of the VEB Combine Robotron, devices from the Hungarian People's Republic, The People's Republic of Bulgaria, Czechoslovakia, and the Polish People's Republic are also used as external units.

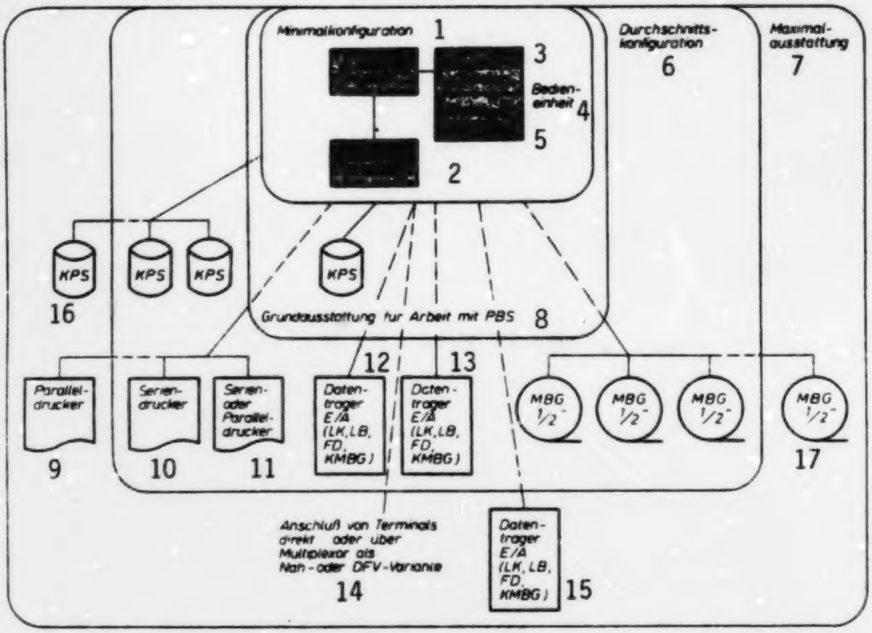
Minimalkonfiguration 1
3
Bedien-einheit 4
5
2
Durchschnitts-konfiguration
6
Maximal-ausstattung
7
KPS
KPS
KPS
KPS
16
Grundausstattung für Arbeit mit PBS 8
12
13
Parallel-drucker
Serien-drucker
Serien- oder Parallel-drucker
9
10
11
Daten-träger E/A (LK, LB, FD, KMBG)
Daten-träger E/A (LK, LB, FD, KMBG)
MBG 1/2"
MBG 1/2"
MBG 1/2"
MBG 1/2"
17
Anschluß von Terminals direkt oder über Multiplexor als Nah- oder DFV-Variante
14
Daten-träger E/A (LK, LB, FD, KMBG)
15

Figure 2: Configuration Possibilities of the Commerical Basic Computer Systems

Key:
1. Minimal configuration
2. Data medium I/O
3. Display screen + keyboard
4. Operating unit
5. Serial printer
6. Average configuration
7. Maximum equipment
8. Basic equipment for work with PBS (peripheral operating system)
9. Parallel printer
10. Serial printer
11. Serial or parallel printer
12. Data medium I/O (punched card, paper tape, floppy disk, cassette tape)
13. Data medium I/O (punched card, paper tape, floppy disk, cassette tape)
14. Connection of terminals directly or through multiplexor as local or remote data processing variant
15. Data medium I/O (punched card, paper tape, floppy disk, cassette tape)
16. Cassette disk memory
17. Tape unit 1/2 inch

Table 2 shows the peripheral equipment that is primarily intended for connection.

The following devices are thus primarily used as external memories:

- tape memory units (1/2" and cassette units)
- cassette disk memories.

The use of fixed-disk memories is also planned.

Besides the possibility of connecting 1/2" tape units, the performance capability is significantly determined by the disk memories. These memories offer the possibility of direct access to larger amounts of data.

Numerous applications can be processed only with direct access to large amounts of data. These include problems of inventory management, information retrieval in the conversational mode, etc.

Floppy disks can also be used as external memories.

With the input and output peripheral equipment, the starting point is to satisfy as many user needs as possible. Thus, paper tape and punched card units are furnished for users who work with paper tape or punched card input and who have built up their entire operating organization on these media. These users thus have the possibility of continuing their previous organizational principles. The cassette tape units and floppy disk memories also permit the use of modern data media for input.

Serial printers and parallel printers with various capabilities are available for printed output.

The following terminals of the VEB Combine Robotron can be connected to the commercial basic computer systems. These are currently in development within the framework of the product program "Decentralized Data Technology":

display screen input and output unit
universal ("intelligent") display screen terminal
printer terminal
data station
data acquisition unit
office computer
electronic text processing system.

All the devices listed above are connected through appropriate adapters (connection controls to the system bus of the K 1620/1630 or through the BUS converter at the SKR unit bus.

Table 2: Configuration of the Commercial Basic Computer System Robotron A 6401 and A 6402

1	Geratebezeichnung A	Kurzbezeichnung Land (CM-Nr.) B		Technische Daten C	Gerate-Interface D	Zugeordnete Anschluß-steuerung E	Rechnerseitiges Interface F
2	Lochbandeinheit	K 6200	/DDR	LBL: 200 Zeichen/s, LBS: 50 Zeichen/s, Einschub	IFSP	AIP	Systembus K 1600
3	Lochbandeinheit	SPTP 3 (CM 6204)	/VRP	LBL: 100 Zeichen/s, LBS: 75 Zeichen/s, Einschub	IFSP	AIP	Systembus K 1600
4	Lochbandleser	FS 1503	/ČSSR	1500 Zeichen/s, Auftischgerat	IFSP	AIP	Systembus K 1600
5	Kassettenmagnetbandeinheit	K 5261	/DDR	2 x KMBG K 5200 (Laufwerke), Einschub 750 Zeichen/s, 19 cm/s	IFSS	AIS	Systembus K 1600
6	Seriendrucker	robotron 1152	/DDR	30 Zeichen/s bei 132 Zeichen/Zeile, Auftisch- oder Standgerat	IFSS	AIS	Systembus K 1600
7	Paralleldrucker	VT 27065	/UVR	660 Zeilen/min, 136 Zeichen/Zeile, Standgerat	IFSP	AIP	Systembus K 1600
8	Bedieneinheit	K 8911	/DDR	31-cm-Bildschirm, 24 Zeilen mit 80 Zeichen, alphanumerische Kompakttastatur, Auftischgerat	IFSS	AIS	Systembus K 1600
9	Fernschreibmaschine	T51, T63	/DDR	50 Bit/s, Auftischgerat	IFS 1	AIS	Systembus K 1600
10	Bildschirm E/A-Gerat	K 8912	/DDR	31-cm-Bildschirm, 24 Zeilen mit 80 Zeichen, alphanumerische Kompakttastatur, Auftischgerat	IFS 2	AIS	Systembus K 1600
11	Magnetbandgerat	ISOT (CM 5300)	/VRB	10 k Byte/s, 32 Bit/mm, Einschub	IFMB	AMB (CM 5001)	SKR-Einheitsbus
12	Magnetbandgerat	ISOT (CM 5303)	/VRB	36 k Byte/s, 32 Bit/mm, Einschub	IFMB	AMB (CM 5001)	SKR-Einheitsbus
13	Kassettenplattenspeicher	ISOT (CM 5400)	/VRB	1 Fest-, 1 Kassettenplatte mit je 25 M Bit, 2,5 MHz, 60 ms, Einschub	IFKP	AKP	Systembus K 1600

Key:

1A Device designation
1B Abbreviation country (CM-Number)
1C Technical data
1D Device interface
1E Associated connection control
1F Interface on the computer side

2A Paper tape unit
2B K 6200 /GDR
2C LBL: 200 characters/s LBS: 50 characters/s, insert
2F System bus K 1600

3A Paper tape unit
3B SPTP-3 (CM 6204) Polish People's Republic
3C LBL: 100 characters/s, LBS: 75 characters/s, insert
3F System bus K 1600

4A Paper tape reader
4B FS 1503, Czeckoslovakia
4C 1500 characters/s, desktop unit
4F System bus K 1600

5A Cassette tape unit
5B K 5261 GDR
5D 2 x KMBG K 5200 (drives), insert, 750 characters/s, 19 cm/s
5F System bus K 1600

6A Serial printer
6B Robotron 1152 GDR
6C 30 characters/s for 132 characters/line, desktop or stand-alone unit
6F System bus K 1600

7A Parallel printer
7B VT 27065, Hungarian People's Republic
7C 660 lines/min. 136 characters per line, stand-alone unit
7F System bus K 1600

8A Operating unit
8B K 8911 GDR
8C 31 cm display screen, 24 lines with 80 characters, alphanumeric compact keyboard, desktop unit

Table 2 Key (continued)

9A	Telex machine
9B	T41, T63, GDR
9C	50 bit/s, desktop unit
9F	System bus K 1600
10A	Display screen I/O unit
10B	K 8912 GDR
10C	31 cm display screen, 24 lines with 80 characters, alphanumeric compact keyboard, desktop unit
10F	System bus K 1600
11A	Tape unit
11B	ISOT (CM 5300) People's Republic of Bulgaria
11C	10 K bytes/s, 32 bits/mm, insert
11F	SKR unit bus
12A	Magnetic tape unit
12B	ISOT (CM 5303), People's Republic of Bulgaria
12C	36 k bytes/s, 32 bits/mm, insert
12F	SKR unit bus
13A	Cassette disk memory
13B	ISOT (CM 5400) People's Republic of Bulgaria
13C	1 fixed; 1 cassette disk each with 25 M bit, 2.5 MHz, 60 ms, insert
13F	System bus K 1600

Besides the connection controls for device-specific interfaces, there are adapters for the internationally coordinated interfaces such as IFSS, IFSP, and S2 (V.24). With IFSS (serial), it is possible to manage a distance up to 500 m at a transmission rate up to 9,600 bits per second.

Larger distances are possible with a lower transmission rate.

Because of the multiplicity of the peripheral devices, the system can be equipped in very differentiated fashion, corresponding to user needs.

As a system with minimum equipment, e.g. with

- an operating unit (display screen and keyboard)
- serial printer
- cassette tape unit or floppy disk,

a commercial basic computer system makes contact with the office computers from the point of view of performance. In such a configuration it can be used e.g. for scientific-technical calculations, for which only a little external storage capacity is needed.

In a maximum configuration, e.g. with

- 1/2" tape units
- disk memories
- parallel printers
- terminals,

the basic computer systems reach the performance of the smaller systems of the ESER.

3. System Documentation for the Commercial Basic Computer Systems A 6401 and A 6402

System documentation is being developed and made available for the microcomputer system K 1600. The following are useful for the commercial basic computer systems:

operating system MOOS 1600
CROSS system documentation
problem-oriented system documentation
a technology for the efficient development of system documentation.

4. Examples of Applications

The system is comparable in its size category with the Robotron 4201 computer, which at this time is still in production, but it surpasses this computer with respect to the peripheral equipment that can be connected and with respect to the performance capability of the operating system.

Three possible applications:

Use as an Autonomous Computer in the Computer Center of an Industrial Business

On the basis of its performance data, the commercial basic computer system can be used for computational problems in a small-to-medium industrial business.

Thus, for example, the following problems can be solved:

- wage and workforce calculations
- materials economy
- costs and financial calculations
- production planning and guidance.

The working mode can here be fully autonomous. Data acquisition tasks can be processed both on the basis of paper tape and punched card technology and on the basis of data acquisition and preparation technology with connected cassette-tape or floppy disk memories.

The connection of disk memories to the system allows working with copious files, such as are required e.g. in materials economy, in workforce calculations, or in engineering.

Data acquisition terminals can also be connected for data acquisition work which occurs in the context of such problems. The coupling of the commercial basic computer system with a supervening computer, e.g. a computer of the ESER, is also possible through a remote data processing line.

Use as Computer for Room Reservation and Hotel Information

The commercial basic computer system can also be used as a computer for hotel problems, especially room reservations. Because of the capacity of the computer (working-storage size and speed) as well as because of the connectible peripheral equipment (KMBG (expansion unknown), cassette disk memory), it is possible to connect to such a system a large number of hotels with various room categories for a reservation period of several months.

The following taks are here processed

- reservations
- waiting-list processing
- statistics and information
- file maintenance.

The data (reservation wishes) are here primarily inputted through display screen terminals, which are connected directly or through remote data processing equipment.

Use as Electronic Data Processing System in Medicine

The commercial basic computer systems A 6401/A 6402 are also suitable and intended for tasks of patient-related information processing in medium-large hospitals or in component areas of large hospitals. The following task complexes can here be processed:

- patient admission, assignment, and discharge
- patient-related documentation
- medical-statistical evaluations
- optimization of medical diagnosis
- processing of tasks relating to the planning, management, and administration in the hospital.

The processing of these task complexes leans on data banks with the operative, patient-related data inventory and with nonpatient-related information. The data are inputted and the stored data are accessed largely through display screen terminals, which can be set up locally an and remotely.

It is possible to couple the commercial basic computer system with a large-scale central computer.

These three applications show that the basic computer systems practically are not subject to any restriction as regards their application.

PHOTO CAPTIONS

1. p 11. Commercial Basic Computer System A 6401 (Two-Cabinet Variant)
2. p 13. Commercial Basic Computer System A 6401 (Single-Cabinet Variant)

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GERMAN DEMOCRATIC REPUBLIC

MICROPROCESSOR K 1600 AS PROCESS COMPUTER SYSTEM

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 17 No 9, Sep 80 pp 14-16

/Article by Wolfgang Branitz, VEB Robotron Center for Research and Technology, Dresden: "Microprocessor K 1600 As Process Computer System"/

/Text/ Production of the Robotron 4000 family will shortly run out, but the need for automatic production control, laboratory and test-panel automation, as well as other real-time systems will continue to rise in the eighties. Consequently, process computer systems of the medium power class must be developed on the basis of the microcomputers K 1620 and K 1630. Based on the variable equipment of the microcomputers K 1620 and K 1630 with peripheral units and system documentation, "basic computer systems" are being offered for various power requirements and various application areas.

The application variants are supported, among other things, by the design of the Ursadat 5000 within the system Ursatron 5000. This utilizes the technical capabilities of microprocessors and other microelectronic components to construct a new device generation with qualitatively higher characteristics. With the new capabilities, new applications naturally also open up, which previously did not exist, for technical or economic reasons, with process computers based on the Robotron 4000 computer family. Thus, the new process computer systems now can e.g. be easily decentralized, where the basic units Ursadat 5000, which are directly located at the process, contain the microcomputer K 1520 and thus take over the acquisition of measured values, the output of control values, and the primary processing.

Main Use Variants for Process Computer Systems

Complete process computer systems of various capabilities and configurations

Process guidance computer for hierarchically structured automation systems

Combined use as process computer and mini-data-processing system.

1. System Survey of Process Computer Systems

1.1. Overview

The process computer system is an application-oriented configuration consisting of a computer, operating equipment, and peripheral devices and system documents. In dependence on the configuration and the application characteristics associated therewith, the following process computer systems are being offered:

A 6491 - complete process computer system with Ursadat 5000 and microcomputer K 1620

A 6492 - complete process computer system with Ursadat 5000 and microcomputer K 1630

Another variant as process guidance computer based on the microcomputer K 1630 without Ursadat is anticipated.

1.2. Microcomputer K 1600 and Peripheral Equipment

The microcomputers K 1620 and K 1630 form the core of the process computer systems (PRS). Peripheral units are connected to them, and these units are identical with those for the commercial basic computer systems. The PRS have a device spectrum that differs from the commercial basic computer systems only by their capability of additionally connected the process input/output unit Ursadat 5000.

1.3. Process Input/Output Unit Ursadat 5000

1.3.1 Structure

The basic unit is the basic element of the Ursadat 5000. This represents a universal, modular, expandable unit based on the microcomputer system K 1520, including associated memories, process input/output modules, connection possibilities for data processing peripheral equipment, and interfaces for information transmission. The connection to the K 1600 is established through a fast serial interface, to which several Ursadat basic units can be connected (Figure 1).

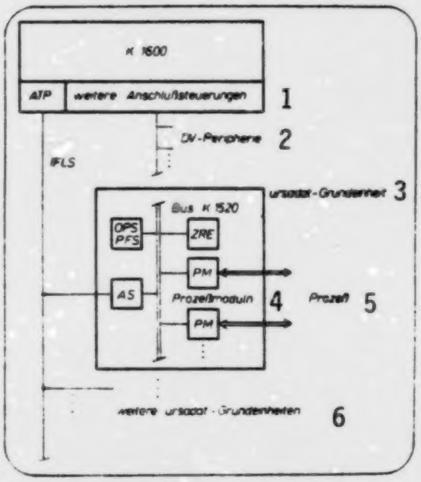
K 1600
ATP
weitere Anschlußsteuerungen
1
DV-Peripherie
2
IFLS
ursadat-Grundeinheit
3
Bus K 1520
OPS
PFS
ZRE
PM
AS
Prozeßmoduln
4
Prozeß
5
PM
weitere ursadat-Grundeinheiten
6

Figure 1: Structure of the Process Computer System
Key:
1. Further connection controls
2. Data processing peripheral equipment
3. Ursadat basic unit
4. Process modules
5. Process
6. Further Ursadat basic units

1.3.2. Interface

Information between the computers K 1620/1630 and the Ursadat basic units is exchanged through the IFLS (interface line-shaped, serial, ASU TP). This is characterized by the following technical parameters:

- Transmission rate:	500 k bit/s
- Effective data rate:	about 120 k bit/s
- Transmission range:	maximum 3 km
- Line:	2-wire transmission over coaxial cables with transformer couplings of the stations
- Transmission:	serial, synchronous, bi-phase-difference-modulation.

At most 100 m can be spanned with the local variant, which operates without modulation.

In terms of devices the IFLS is implemented in the K 1600 through the connection control ATP, which is connected to the system bus K 1600. It is possible to connect a maximum of 60 basic units (25 with the local variant). This number is reduced because of the effective data transmission rate of the IFLS and because of specific use conditions. It depends strongly on the particular application.

1.3.3. Transmission of Information

The transmission of information between the computer and the basic units occurs by means of limited bit sequences (transmission frames) byte-serially with a maximum of 250 data bytes, on the basis of the HDLC procedure (High Level Data Link Control Procedure).

The transmission frame has the following structure:

Synchronization byte/address byte/function byte/data byte/two-byte control section/synchronization byte.

The synchronization byte is used to delimit and synchronize the frame.

The address byte contains the address of the receiving station.

The function byte characterizes, among other things, the station type, the format, and the procedure.

The data comprise at most 250 bytes, where the number of data bytes is specified in the first data byte.

The two-byte control section is formed according to the polynomial $X^{16} + X^{12} + X^5 + 1$.

Depending on the function of a station at the IFLS, three different station types can be distinguished:

central
control station
controlled station.

The central specifies which station is the control station and what happens by transmitting a transmission frame with the corresponding station address and the identification in the function byte. The control station makes a connection with a controlled station and thus initiates data transmission. The controlled station sends an acknowledgment to the control station. If the control station has effected all the required transmissions, it reports this to the central, so that the central can specify a new control station.

The K 1600 is always a central and a control station. The basic units Ursadat 5000 are thus always controlled stations and cannot exchange information among one another. In case of trouble with the K 1600, a computer provided for this contingency (K 1600, K 1520) can take over the function of the control station.

1.3.4. Ursadat Basic Unit

The basic unit (GE) is the basic element of the process input/output unit Ursadat 5000. Its basis is formed by the microcomputer system K 1520. Each GE contains as its central part a microcomputer K 1520 and the corresponding memory modules. Depending on the project, these are supplemented by process modules, further modules of the K 1520 system, and the connection control for the interface IFLS. All are connected to the K 1520 bus. The GE consists of one or two module supports in EGS (uniform vessel system) design. Every module support has available 23 slots for printed circuit boards, of which a maximum of 16 can be used for process modules. All together no more than 25 process modules (with connection to the K 1520 bus) can be connected to each GE. Each GE has its own power supply.

Process Modules:

- analog input/output (AE/AA)
- digital input/output (DE/DA)
- pulse input/output (IZ/IA)
- frequency measurement (IZ)
- incremental output (IA)

Except for the AE, a module is identical with a printed circuit board /1/.

1.3.5. Process Modules

Analog input AE:
- Quantity measured:
  Voltage
  0...10/20/50/100 mV
  0...1/10 V
  bipolar
  Current
  0...5/10/20 mA
  and life-zero signals
  Remote resistance meter
  Resistance thermometer
- Information width: 11 bits + sign.

The AE is divided into the AE basic card with 8 inputs and maximally 2 expansion cards each with 24 inputs. Adapter cards are connected before the inputs, with 8 inputs per card with current inputs and 10-V voltage inputs or respectively 4 inputs per card with resistance inputs, mV-inputs, and inserted isolation amplifiers (Figure 2).

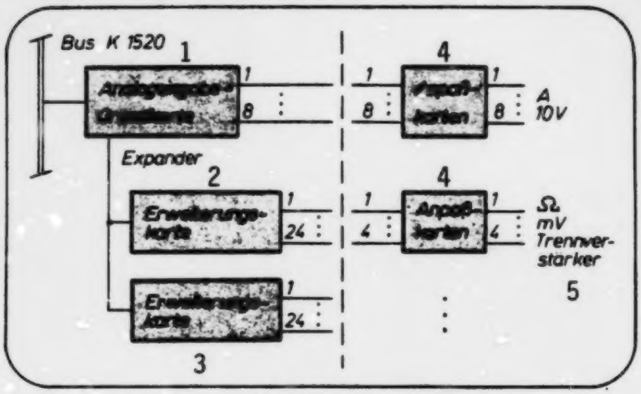
Bus K 1520
1
1
8
Expander
2
Erweiterungs-
karte
1
24
3
Erweiterungs-
karte
1
24
4
1
8
karten
1
8
A
10V
4
1
4
Anpaß-
karten
1
4
Ω
mV
Trennver-
stärker
5

Figure 2: Analog Input Ursadat 5000

Key:

1. Analog input basic card
2. Expansion card
3. Expansion card
4. Adaptation cards
5. Isolation amplifier

Analog Output One Channel AA-1 K:
9 bit + sign
0.....10 V, -10...+10 V
0....5 mA, 1...5 mA, -5...+5 mA
0....20 mA, 4...20 mA
It is possible to change over to an external analog value.

Analog Value Output Five Channels AA-5 K:
8 bit + sign
0....10V, -10...+10 V
0....5 mA, -5...+5 mA
No DC isolation possible.

Digital input static DES
Digital input dynamic DED
Digital output multiplex DEM
16 bits per module for DES and DED, 16 x 8 bits for DEM.

Digital output, static and dynamic:

through transistor DA-T	32 bits
through optocoupler DA-O	16 bits
through relays DA-R	24 bits
through reminant relay DAS-H	8 bits (only static)

Digital input/output DEAS:
6 x 4 bits (in stages of 4 bits, programmable as input or output).

Pulse counter IZ:
32-bit information width
The IZ can be used as a pulse counter, timer, and frequency meter with various information widths.

Pulse output IA:
2 x 8 bits as time signal output or as pulse output.

1.4. System Documentation

The operating system MOOS 1600 and the cross section POS have been developed for the PRS (process computer systems). The operating system EIOS can be used in the Ursadat basic units. The channel software for operating the process modules is included in the control program EIEX 1521. It can be generated in correspondence with application requirements. Furthermore, programs for the acquisition and processing of measured data as well as for outputting control values on the Ursadat basic units operate under the control of the EIEX.

2. Application of the Process Computer Systems

The application of the PRS will be illustrated by a particular application which is currently in preparation at the Central Institute for Nuclear Research in Rossendorf /2/. This application can be regarded as representative for automation systems in flow processes (e.g. power plant engineering, chemistry). It furthermore has the characteristics of systems for laboratory automation.

The following automation tasks should be solved at the Rossendorf Research Reactor:

- displaying the process status on display screens
- process monitoring
- digital control of reactor power
- start-up/shutdown and power change
- analysis of interferences
- analysis of accidents
- control of the charging and discharging of radiation samples
- supporting physical experiments
- using methods of room diagnostics

Figure 3 gives an overall view of the structure of the PRS that is used here.

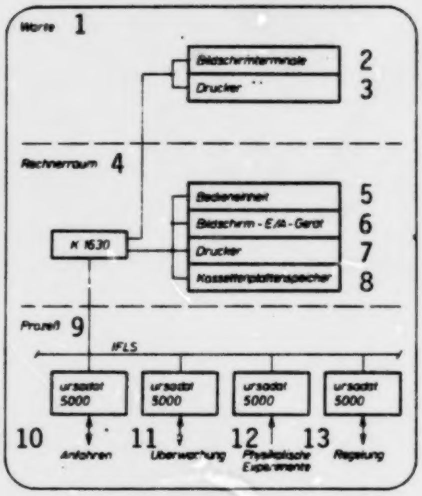
Warte 1
Bildschirmterminale 2
Drucker 3
Rechnerraum 4
Bedieneinheit 5
Bildschirm - E/A - Gerät 6
K 1630
Drucker 7
Kassettenplattenspeicher 8
Prozeß 9
IFLS
ursadat 5000
ursadat 5000
ursadat 5000
ursadat 5000
10
Anfahren
11
Überwachung
12
Physikalische Experimente
13
Regelung

Figure 3: Basic Structure of the Process Computer System of the Rossendorf Nuclear Research Center

Key:

1. Control room
2. Display screen terminals
3. Printer
4. Computer room
5. Operating unit
6. Display screen I/O unit
7. Printer
8. Cassette disk memory
9. Process
10. Start-up
11. Monitoring
12. Physical experiments
13. Regulation

Its core is the K 1630 with its data processing peripheral equipment. The connection to the process is made through several Ursadat basic units, which are associated with particular automation tasks. The process information for the system operator is displayed through the display screen terminals at the console, and the interactive mode conversation is also carried out there.

The division of tasks between the Ursadat 5000 and the K 1630 will be illustrated by the process monitoring and by the display of the process status.

The Ursadat is used for the following tasks:

time-cyclical interrogation of measured data
time-cyclical primary processing with the components
- plausibility test
- dimensioning
- monitoring of limit values
- storing of the prehistory
- calculation of statistical quantities (e.g. averages)
- corrections of measured data
- calculation of derived quantities (e.g. temperature difference)

composition of current data from measurement points into blocks with easy access
treatment of interferences with initiation of an alarm
treatment of spontaneous signals from the process.

The following tasks are processed by the K 1630:

processing the dialogue inputs
taking over current data from measurement points and alarm messages from the basic units
preparing and updating the pictures which characterized the process status
storing the current process status for use in other task complexes
preparation and output of various records.

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GERMAN DEMOCRATIC REPUBLIC

DESCRIPTION OF MOOS 1600 OPERATING SYSTEM

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 17 No. 9, Sep 80 pp 17-20

/Article by Claus Rossberg, VEB Robotron Center for Research and Technology, Dresden: "Operating System MOOS 1600"/

/Text/ While the basic computer systems A 6401 and A 6402 are primarily used for economic calculations, the process computer systems A 6491 and A 6492 work as complete process computer systems or as process control computers.

Because of these application areas, there sometimes are different requirements for the particular operating system that is used for the computer. When the computer is used as a commercial basic computer system, work with files occupies the foreground. On the other hand, its use as a process computer system generally requires fast reaction to process events and a well-developed organization for executing user programs.

These requirements are fulfilled by the modular operating system (BS) MOOS 1600. From its module inventory, it is possible to generate operating systems with various use characteristics and capabilities.

The BS MOOS 1600 furnishes not only direct support for applications of the K 1600 computer but also provides extensive technological means for the production and testing of user programs. The development of the BS MOOS 1600 had the objective of guaranteeing, at the level of user programs, compatibility to the corresponding operating systems of the SKR (minicomputer systems).

In addition to the BS MOOS 1600, the BS LAOS 1600 is also being developed. This is especially suited for computer systems with a smaller configuration and for the needs of laboratory and test panel automation.

1. Applications Area

The operating system (BS) MOOS 1600 consists of a set of modules and programs from which one can generate operating systems that are memory-resident both internally and externally for

automatic production control
data acquisition systems
mini-data processing systems
laboratory and test panel automation

It is also possible to generate operating systems for applications in boundary situations of the above-mentioned areas or for their overlaps.

A special position is here occupied by operating systems that are internally memory-resident and which have been generated from MOOS 1600. These systems are not designed for program developments. For this purpose, operating systems memory-resident on disk and generated from MOOS 1600 are more suitable.

In designing the MOOS 1600, an important role was played not only by fast reaction time to real-time requirements but also by the possibility of multiprogramming. Accordingly, MOOS 1600 is oriented towards application areas which extend from its use as an independent process control system to its use as a multi-user system.

The BS MOOS 1600 is developed step by step. Several editions are intended, of which the preceding one is always completely contained in the next one. The performance scope of the first two editions has already been designed.

2. Components of the BS MOOS 1600

The essential components of the BS MOOS 1600 are the following:

executive MOEX 1600
macroassembler (MAC)
compiler for
    FORTRAN IV (FOR)
    COBOL (COB)
    CDL (Compiler Description Language)

task builder (TKB)
editor (EDI)
library editor (LBR)
test program (DEP)
file access routines (FCS)
    sequential and direct access
    command-times interpreter
file transfer program (PIP)
file test program (VEY)
file print program (DMP)
file save and compression program (DSC)
file conversion program (FLX)
paper tape input program (PTI)

The BS MOOS 1600 consists of the executive program (control program) and the system programs, which work under the control of the executive program.

The system programs are used for program development and translation, to execute special system management functions, for working with files and for input/output support.

The system programs use all disk files, and therefore presuppose an operating system resident on disk memories. The collaboration of various system programs to produce a runnable user program is shown in Figure 1, using as an example an assembler program written in MACRO 1600.

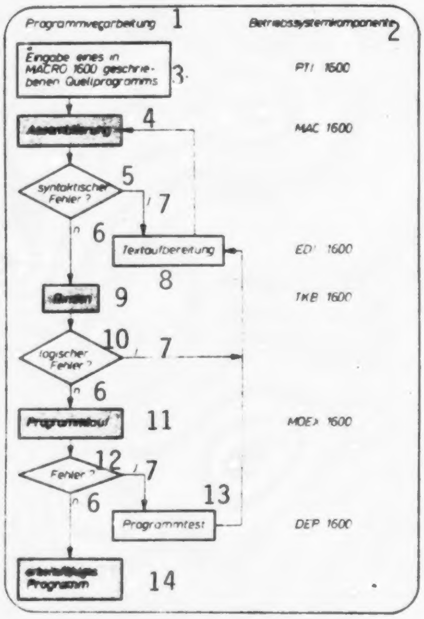
Programmvorbereitung 1
Betriebssystemkomponente 2
Eingabe eines in MACRO 1600 geschriebenen Quellprogramms 3
PTI 1600
Assemblierung 4
MAC 1600
syntaktischer Fehler ? 5
j 7
n 6
Textaufbereitung 8
EDI 1600
Binden 9
TKB 1600
logischer Fehler ? 10
j 7
n 6
Programmlauf 11
MOEX 1600
Fehler ? 12
j 7
n 6
Programmtest 13
DEP 1600
arbeitsfähiges Programm 14

Figure 1: Sequence for the Production or a Runnable Program, Written in MACRO 1600

Key:

1. Program generation
2. Operating system component
3. Input of a source program written in MACRO 1600
4. Assembly
5. Syntactical errors?
6. No
7. Yes
8. Text preparation
9. Linkage
10. Logical errors?
11. Program execution
12. Errors?
13. Program test
14. Runnable program

3. Basic Functions of the System Programs

The Macroassembler translates source programs which are written in the assembler language MACRO 1600. It offers the capability of conditional assembly. This allows the translation of program sections in dependence on values of certain variables, which are specified at assembly time, or to exclude such program sections from translation. Global symbols can establish the connection among program modules that have been translated independently of one another. It is possible to output a CROSS reference list.

The FORTRAN compiler implements the FORTRAN IV standard as well as several extensions that are convenient for the users. FORTRAN programs can use nearly all executive instructions, and specifically through subprograms of the system library. Besides the translation list, a storage allocation table and a list of the generated code can also be outputted. The programming of test lines is provided for logical error search. This can be translated as instructions or commentary. A running-time system monitors the processing of FORTRAN programs and indicates errors that may have occurred. In the case of errors that occur in subprograms, the cause is traced back into the calling program.

There are two versions for COBOL:

a strongly reduced version for the K 1620, that is compatible with K-1520 COBOL

a version for the K 1630, which essentially includes the full scope of the COBOL standard.

Here COBOL 1620 is a subset of COBOL 1630. The COBOL 1630 compiler (COB 1630) and the programs generated by COB 1630 cannot run on the K 1620.

The CDL programming system facilitates effective working with the system programming language CDL 1600. It consists of a library compiler for translating macrolibraries, a CDL compiler for translating CDL-1600 modules, and a running-time system.

The CDL language was specially created for the development of compilers. However, it is suitable for many user problems because of the following characteristics:

It forces programming with a tree structure.

It makes possible a modular program structure.

It guarantees high effectiveness of object programs with respect to running time and storage space.

It has a high degree of self-documentation.

> Despite the problem-oriented programming level, it permits a good connection with the actually used computer system.

The CDL language is also used, for example, in the development of POS modules.

CDL has only a few but effective means of expression. Certain elementary functions must be written as macros in the assembler language MACRO 1600, so that all the means of expression existing there can be used. The macros are stored in libraries. During translation with the compiler, a target program in the assembler language MACRO 1600 is generated on the basis of a macro library. This target program must be processed further by the assembler.

The task builder processes one or more object modules, which are independent of the programming language used, into executable programs, the tasks, and rolls out a faithful image of storage, the task image file, together with information concerning the task, on the systems residence. The formation of the task is influenced by commands and by the overlay description for the task. In this way, for example, the following can be specified or instigated:

the position of the task in the user program system
access rights to protected data areas
roll-out possibilities in case of an interrupt
the size of cellar areas
the overlay structure of the program
the inclusion of test programs.

Furthermore the task builder can create common areas for data and storage areas for subprograms that are used by several tasks. Besides forming the task, the task builder makes available to the user various information concerning the task, such as a cross-reference list of all global symbols used in the task and a list of all object modules used in forming the task.

The editor can process files (source programs or other text material). For this purpose, individual lines or blocks of lines can be read from an input file into a working storage buffer, can be processed there, and finally can be written into a new output file. The processing takes place both line- and character-oriented. By means of special commands, the second input file can also be opened during the process, and can be selected for accepting text sections. By closing the selected second input file, it is possible to assemble a text from texts of arbitrarily many input files.

The library editor gives the user extensive management capability of object- and macro-library files, which are available to access by the task builder and the assembler. Besides generating libraries, it is possible to erase individual modules, to compress a library that is only partially occupied because of erasures, to detach, insert, rename, and replace individual modules.

By means of the test program, assembler programs can be tested logically if they have been combined into a task together with this test program, by means of the task builder. By setting interrupt points and by interpretive program processing, the following functions become possible:

input and output of storage location and register contents

searching for bit patterns and instructions with particular address references

calculating of offsets, codings, and arithmetic expressions

step-by-step program execution.

The file access routines represent a set of subprograms which are bound to the user tasks and which, within these tasks, implement access to files of the MOOS 1600, as instructed by the macro calls. The I/O operations can be block- or record-oriented. The following access forms are supported:

sequential for files with records of fixed and variable length

freely, with direct addressing for files that have records of fixed length.

While direct access to disk files is possible, work with sequential files can be programmed device-independent.

A command line, which has been inputted by a user through a terminal, can be interpreted, by means of special subprograms, as a sequence of input and output file specifications and switches, which control the operation of the user program with the files of the BS MOOS 1600.

The main task of the file transfer program consists in transporting and copying files. Data can be transported between various units or from one disk area to another. The copying and insertion functions for files, overwriting an existing file with a new one, and adding a file to another one, are here possible. Furthermore, this program can also facilitate tasks without file transport, such as the erasure of files, the output of file indexes, changes in a file index (name, access rights, etc.) and the processing of blocked files.

By means of the file testing program, it is possible to test the status of disk files and to access data which are no longer available for normal access. Furthermore, the number of still free blocks on a disk can be determined and all file names can be printed out.

The file print program permits the output of the content of files or selected portions of files or entire data media in various representational forms.

By means of the file-save and compression program, disk files can be rolled out e.g. onto tape, and files can be moved so as to combine scattered free areas on disks.

The file conversion program allows the conversion of files in various file formats and consequently makes possible the acceptance of data inventories from other operating systems, e.g. from LAOS 1600.

By means of the paper tape input program, data generated on data acquisition devices, such as source programs, can be taken over as files on the disk memory, so as to undergo further processing there.

4. Basic Functions of the Executive Program MOEX 1600

The following overview assembles the basic functions of the executive program MOEX 1600 of the BS MOOS 1600. An "x" indicates the edition of the operating system in which the corresponding basic function is contained. This overview also shows that the generation of operating systems that are internally memory-resident becomes possible only with edition 1.2. It also shows that some basic functions, e.g. a file system, do not exist with operating systems that are internally memory-resident.

The capabilities of the executive program can be used through executive instructions (macros) contained in the tasks or, by the operator, through commands.

	Edition		
	1.1		1.2.
	ex.	int.	ex.
Multiprogramming			
Priority control	X	X	X
Time-sharing	-	-	X
Multi-user operation	-	-	X
Background work for program development	X	-	X
Batch processing	-	-	X
Logical connection of several user programs	X	X	X
Dynamic working storage management	-	X	X
Automatic restart after power failure	-	X	X
Storage protection	-	X	X
Time organization	X	X	X
Support of user-related computer-time determination	-	-	X
Command work	X	X	X
Logical file system	X	-	X
Logical I/O system	X	-	X

	Edition		
	1.1.		1.2.
	ex.	int.	ex.
Indirect outputs for logging units	-	-	X
Reservation of devices and files for			
certain user programs	X	-	X
certain users	-	-	X
Allocation of physical device addresses to logical device designations	X	X	X
Operation of devices	X	X	X

ex. = resident on external memory
int. = resident on internal memory

Multiprogramming

Although only the executive program or a task can at any one time control the CPU (central processing unit), multiprogramming is possible because waiting times arise during the processing of a task (e.g. waiting for the end of an I/O operation). During these times, the executive program can organize the execution of other tasks.

With multiprogramming, it is possible to control a number of tasks that is limited only by practical perspectives. For the control by priority, 850 priority levels are available. The priority can be assigned to the task while it is being structured by the task builder or before it is executed. It can also be changed during execution. The task with the highest priority, which has access to all system capabilities required by it (memory, peripheral equipment), and which itself is not waiting for some event, obtains control of the CPU. Depending on the character of the task to be solved, the priority can achieve a sensible distribution of CPU time among individual tasks.

For various task complexes, a pure priority-controlled execution of tasks is not sufficient, since an approximately equal-priority processing of various component problems becomes possible only by considerable organizational effort on the part of the user. For this reason, a time-slice control can be generated for tasks of equal priority. Normally, these tasks are assigned free CPU time in the sequence in which they report for execution. On the basis of time-slice control, the sequence of these tasks can constantly be interchanged cyclically, however, so that in this fashion each task occupies every place in the sequence during the course of time.

Multi-user Operation

Special monitoring and control functions can be generated for multi-user operation, by means of which the individual users can be monitored and controlled. The users, from their terminals, have restricted rights with respect to the system manager. The latter assigns an identification code to each user, which also specifies the privilege status of the user. Only after inputting an associated identification code and password, can the user make further inputs on his terminal and thus use the system. Access rights to files and devices can be differentially specified for the users. In this way, and through the command inventory that is restricted with respect to a system manager, protection of the users among one another is secured.

Background Work for Program Development

Only operating systems resident in external memories permit program development. All system programs required for this work only with disk files.

Logical Connection of User Programs

For the logical connection of several tasks among one another, common storage areas as well as executive instruction, e.g. for starting a task, are available.

Dynamical Working Storage Management

The storage organization of the MOEX is based on a division of the free working storage into partitions. A task is processed in a partition. A partition is a contiguous storage area, which is identified by its name, type, basis address, and length. MOEX supports two types of partitions, the user-controlled and system-controlled partitions. The user-controlled partition can be subdivided into at most seven subpartitions. It is thus possible, e.g. to alternate the processing of one large task and at most seven small tasks within one partition. The assignment of a task to a user-controlled partition is already done by the task builder. The starting address of the task is equal to the base address of the partition. System-controlled partitions are possible only with systems that are generated for a K 1630 with a storage management unit SVE 30. In this case, the executive routine organizes the storage area allocation so that as many tasks as possible can be located simultaneously in one partition. This dynamic main storage management is based on the utilization of the SVE of the K 1630. The SVE 30 links the addresses of a program (0...32 K words) with the physical addresses of the memory (0...124 K words). If the dynamic working storage management has been generated, each task can begin with the starting address 0 and, through the address linkage via the SVE 30, can be processed in every partition of the memory. The memory is large enough to accept the task. Because of the 16-bit addressing technique of the MRS K 1600, at most 32 K words can be addressed. Since the uppermost 4 K addresses are used to address the peripheral equipment, a task can address at most 28 words directly. Larger tasks can be implemented by resolving the tasks into individual segments of an overlay structure.

Automatic Restart After Power Failure

In case of a power failure, all transitory register contents are saved by MOEX, in order to secure meaningful continuance of work after power recovery. The continuance of work presupposes that the tasks that are provided for continuing the work will have available memories with their data preserved. After the power recovery, the executive routine reestablishes the saved status and prepares the I/O drivers, which were active at the time of the power failure, for continuing their work. User tasks have the opportunity of requesting, by means of an executive instruction, information concerning the power recovery. Following power recovery, the processing of these tasks is then initiated through special entry points.

Storage Protection

Storage protection is again guaranteed only with the K 1630 through the SVE 30.

Time Organization

The date and time of day are furnished through the real-time clock that is present in the computer. Furthermore, a one-time and cyclic program start, immediate and delay program start, as well as time-dependent waiting are possible.

Command Work

Besides the normal command work, it is possible to work with indirect command files. These files are provided for frequently recurring command sequences. When processing these command files, the parameters of the commands contained therein can be updated by the operator (e.g. names of files). This provides a very efficient possibility of processing frequently recurring sequences with a low risk of operator error.

Indirect Outputs

A component can be generated which stores all outputs on a writing unit in a disk file. After completion of the task, the generated file is entered into a queue for the output program of this component. The component can freely be used by all tasks. Thus tasks that work in parallel can use the same logging unit.

Operation of Devices

All devices are operated in interrupt operation. This secures the parallel working of the CPU and the devices. The devices can here be assigned to various priority levels for interrupt handling. The I/O requirements of the tasks are entered into queues that are associated with the devices. Accordingly, the task continues to execute and, at a given time, waits for the end of the I/O request. The task receives information concerning the course of data transmission. Error routines proper to the task are used for error handling. I/O drivers as generable components of the MOEX 1600 are made available for the standard peripheral equipment. Furthermore, the user has the opportunity of introducing his own I/O driver into the operating system, if he wants to use special peripheral equipment, and if these drivers are programmed according to specified guidelines. To prevent continuous blockage of the storage location for rarely used I/O drivers, the generating process can integrate several I/O drivers into the system so that they are loaded into the working storage with a command only as they are needed.

The following devices are serviced by MOEX 1600:

With Edition 1.1

display screen input/output unit (operating unit) - K 8911
Cassette disk memory - CM 5400
paper tape unit - K 6200
paper tape unit - CM 6204
cassette tape unit K 5261
tape unit - CM 5300
serial printer - Robotron 1152
serial printer - Robotron 1156
parallel printer - VT 27060/65
universal display screen terminal - K 8931, only through IFSS.

With Edition 1.2, the following will be added:

display screen input/output unit K 8912
universal display screen terminal K 8931, both through IFSS or V24, MODE
serial printer - Robotron 1157
floppy disk unit - K 5665
punched card reader - K 6100
tape unit - CM 5303
telex - T 51/T 63
process input/output equipment - Ursadat 5000
digital plotter
digitalizing unit (physical operation)
BUS coupling unit - BKE 1600-1500, BKE 1600-1520
(thus connection of remote data processing peripheral multiplex 8523 and the like).

As minimum peripheral equipment, an operator unit is required and for operating systems that are resident in external memory a cassette disk memory as system residence. Unless a lower limit is specified by the MRS K 1600, the executive routine can support at most 16 devices or device control units of one type.

The operating system MOOS 1600 is generated according to the special requirements of the user. The generation takes place in three segments, which are controlled by the generation specifications. The first segment is implemented by the Sales Department of the VEB Combine Robotron, but the user can use the other two segments at any time if he has available a computer system with cassette disk memory.

The part of the executive routine that is resident in working storage is assembled from source modules during the first segment, is conditionally assembled, and is stored in a machine-code file. In the second segment, the parts of the executive routine (among others, the command program),which are required by the user and which have been organized as a task, are built up as a machine-code file and are linked with the part that is resident in working storage. The partition specifications are also made.

In the third segment, it is possible to build up the system programs as machine-code files.

The minimal variant of that part of the executive routine that is constantly present in working storage requires 6 K words. In addition, a 2-K-system partition and a user partition of at least 14 K words are required with edition 1.1 and at least 8 K words with edition 1.2, for the system programs.

5. Overview of the BS LAOS 1600

The BS LAOS 1600 is a single-user real-time operating system resident on disk storage.

A macro assembler, a BASIC interpreter, as well as a FORTRAN-IV compiler are available in the operating system. The system programs of the operating systems support the production of the program, the program testing, the mass storage, and the library management, as well as data transport between arbitrary devices.

Typical applications, such as the real-time acquisition of laboratory or experimental data in the foreground and the processing of these data in the background, or the processing of scientific-technical programs in the foreground and program development in the background, can be effortlessly executed with LAOS 1600, if the size of the working storage is suitable.

The following devices are services by the executive routine of the BS LAOS:

display screen input/output unit (operating unit) - K 8911
cassette disk memory - CM 5400
serial printer - Robotron 1152
parallel printer - VT 27060/65

paper tape unit - K 6200/CM 6204
cassette tape unit - K 5261
floppy disk unit - K 5665
tape unit - CM 5300
display screen input/output unit - K 8912
process input/output device - Ursadat 5000
connection control for S2 interface.

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GERMAN DEMOCRATIC REPUBLIC

DEVELOPMENT OF PROBLEM-ORIENTED SYSTEM DOCUMENTATION FOR K 1600

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 17 No 9, Sep 80 pp 21-25

/Article by Dr Erika Horn, VEB Robotron Center for Research and Technology, Dresden: _"Technology for Development of Problem-Oriented System Documentation"7

/Text7 The POS (Problem-Oriented System) technology is generated according to a uniform fundamental design for the computer systems produced by the VEB Combine Robotron (electronic data processing systems of the ESER (uniform electronic data processing system), microcomputer systems, minicomputer systems). The fundamental design is set down in the so-called framework technology for POS development. This framework technology regulates the progress of the POS development process and the fundamental logic of the POS development. Furthermore, it comprises all computer-independent means of POS technology. The POS technology of the K 1600 is also based on the framework technology. The development process of the POS is regarded as a technological process. The POSs are developed through several process stages (design, implementation, test). The result consists of tested module components, modules, programs, and program systems, including the associated documentation.

The process of POS development and maintenance is subdivided, according to activities, into

the main processes: design, implementation, and testing, and

secondary processes: documentation, management, and control.

The main processes here occur in a sequential time sequence and are penetrated and overlapped by the complementary secondary processes.

1. Definition of Objectives and Problems for Problem-Oriented System Documentation

Here belong the following:

objectives and tasks of the POS product being developed
information and data
conditions and characteristics
technical preconditions, etc.

Design

During the design stage, a problem solution must be worked out for a given objective and problem definition, and this must be fixed and documented as the system design of the POS.

Depending on the objective and problem definition, the design process is subdivided into two stages, in the interest of the reusability of solutions:

Problem-Oriented Draft

Result: problem-oriented system draft (problem structure, including partial algorithms, data structure, execution sequence structure).

Program-Oriented Draft

Result: program-oriented system draft (structure as a hierarchy of programming units, including their execution control, data description of data internal to working storage, description of data base in the form of a description of relations and characteristics).

Implementation

In the component process of implementation, the program-oriented system draft is transformed into a program code, which can execute on a specified computer configuration K 1600 under the operating system MOOS 1600.

Testing

During the testing stage, one must verify whether the program code that was produced as the result of the implementation stage, as well as the associated program documentation, in combination with the operating system MOOS 1600 and the device system Robotron K 1600, fulfill the objective and problem definition.

Management

It is the function of management to store, find, and maintain the POS in the development, maintenance, and application process.

Documentation

All relevant data concerning a POS product must here be set down in writing, keeping step with the process of the development of the POS product.

Control

The results and intermediate results of the development process of the POS are technologically checked, keeping step with the process execution.

For these component processes, the POS-K-1600 developer obtains a coordinated assortment of technical means with the POS technology (POST). These are subdivided into methodological and programming means.

The total work of the programming means of the POST 1600 is implemented as an open system. It is possible to fabricate from this both a closed system with a generable scope of services as well as to use individual components. The system of the programming means of the POST 1600 achieves a uniform working level (the communication level of the POST 1600) for communication between the POS developer and the computer system and between the POS developers among one another.

This is semantically independent of the programming languages and operating system variants that are available within the MOOS 1600.

The various performance ranges of the languages of the microcomputer system Robotron K 1600 (e.g. macro-assembler, CDL, FORTRAN, COBOL) and the associated compilers are thus balanced out and are raised to the level of the communication level of the POST 1600.

This primarily involves

- the power power of the linguistic means
- support of structured programming
- test support
- description of and access to the data base
- technical control and security
- management of POS components.

The technical means are furnished as a handbook of POS technology. Its structure, content, and handling will be reported below.

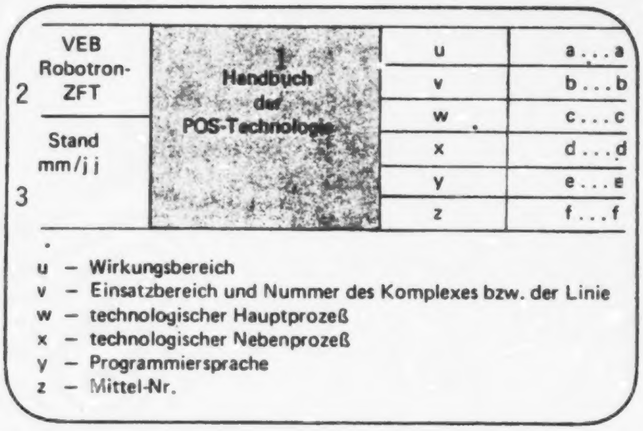
VEB Robotron-ZFT
2
Stand mm/jj
3
1
Handbuch der POS-Technologie
u
v
w
x
y
z
a...a
b...b
c...c
d...d
e...e
f...f
u – Wirkungsbereich
v – Einsatzbereich und Nummer des Komplexes bzw. der Linie
w – technologischer Hauptprozeß
x – technologischer Nebenprozeß
y – Programmiersprache
z – Mittel-Nr.

Figure 1: Classifier of the Handbook of POS Technology
Key:
1. Handbook of POS Technology
2. VEB Robotron Center for Technology
3. Status mm/jj
u - effective area
v - application area and number of the complex or of the line
w - technological main process
x - technological secondary process
y - programming language
z - means number

2. Handbook of POS Technology

The Handbook of POS Technology has a modular structure. The technological means are ordered in the handbook according to a classifier, which makes possible entry into the POS development process according to the conditions of the POS developer in the various stages of development. The classifier also represents the means for selecting and ordering the technological means (Figure 1).

Figure 2 gives a survey of the Handbook of POS Technology for the microcomputer system Robotron K 1600.

The parts of the handbook which are shown or individual combinations thereof are usable independently. The parts always contain the following:

a regulation of the course of the planning process or component process, using the means of the POS technology and the MOS - as a guideline for action

Volumes of the Handbook of POS Technology for the Microcomputer System Robotron K 1600

Classifier No.	Title
3.10.00.0.0.0	Technological line POS for K 1600 (introduction
3.10.00.0.0.1	Rules concerning the architecture and characteristics of POS for K 1600
2.00.11.0.0.1	Problem-oriented design
3.10.12.0.0.0	Program-oriented design of POS for K 1600
3.10.20.0.0.0	Implementation of POS for K 1600
3.10.20.0.1.0	Implementation of POS for K 1600 based on the macro-assembler language
3.10.20.0.2.0	Implementation of POS for K 1600 based on CDL
3.10.20.0.3.0	Implementation of POS for K 1600 based on FORTRAN
3.10.20.1.0.0	Documentation during the implementation of POS for K 1600
3.10.20.1.0.1	Formalized module documentation of POS for K 1600
3.10.20.2.0.0	Checking furing implementation of POS for K 1600
3.10.20.3.0.0	Management during implementation of POS for K 1600
3.10.30.0.0.0	Testing of POS for K 1600
3.10.30.0.1.0	Testing of POS for K 1600 based on the macro-assembler language
3.10.30.1.0.0	Documentation during the testing of POS for K 1600
3.10.30.3.0.0	Management during the testing of POS for K 1600

Figure 2: Overview of the Handbook of POS Technology K 1600

the documentation form of the results and intermediate results of the planning process.

A separate collective volume contains extensive documentation of the programming means. Generally valid methods, principles, procedures, such as the HIPO technique, structogram method, and the like, are available as independent modules of the handbook. By using the systematics of the handbook, the POS developer can assemble that assortment of technical means which he requires.

The content and handling of selected portions of the handbook will be explained below.

Introductory Writings POST 1600: Technological Line for POS K 1600

To this section belongs an introduction to the POST 1600, based on the framework technology. The objective and overall technical process are explained in accord with the conditions of the POS K 1600, and the available technological means are organized. The regulations on the

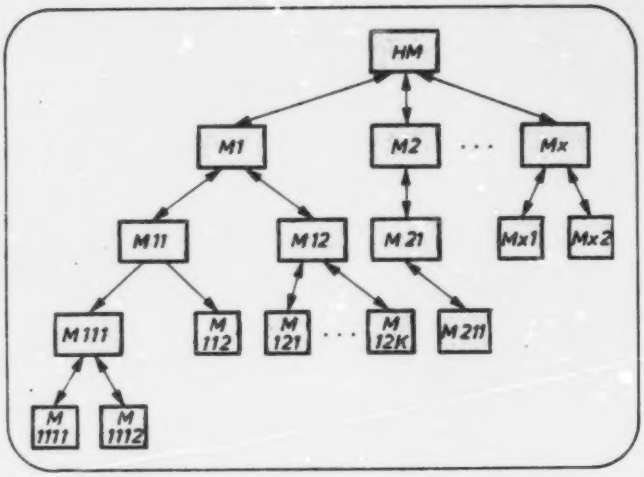

Figure 3: Picture of a Program as a College Hierarchy

architecture and properties of the POS for K 1600 are available as an independent volume of the handbook. Among the essential contents of this volume belong the fundamental concepts of POS technology:

modular design
structure block design
data design
relational design.

These designs specify that each program (program system) is through and through built up in modular fashion, on the basis of independent programming units - modules - and will have a hierarchical program structure (Figure 3).

Furthermore, it means that a POS product consists of a program base and a data base and that the communication between the program base and data base takes place on a logical level (Figure 4).

The data relations in the system are represented by means of relations.

Function-Oriented Design

This point contains the application of the principle of structured design to the design process of problem solutions. The working sequences during functional design are described. A documentation systematic is prescribed for documentation of the problem-oriented system design. The documentation

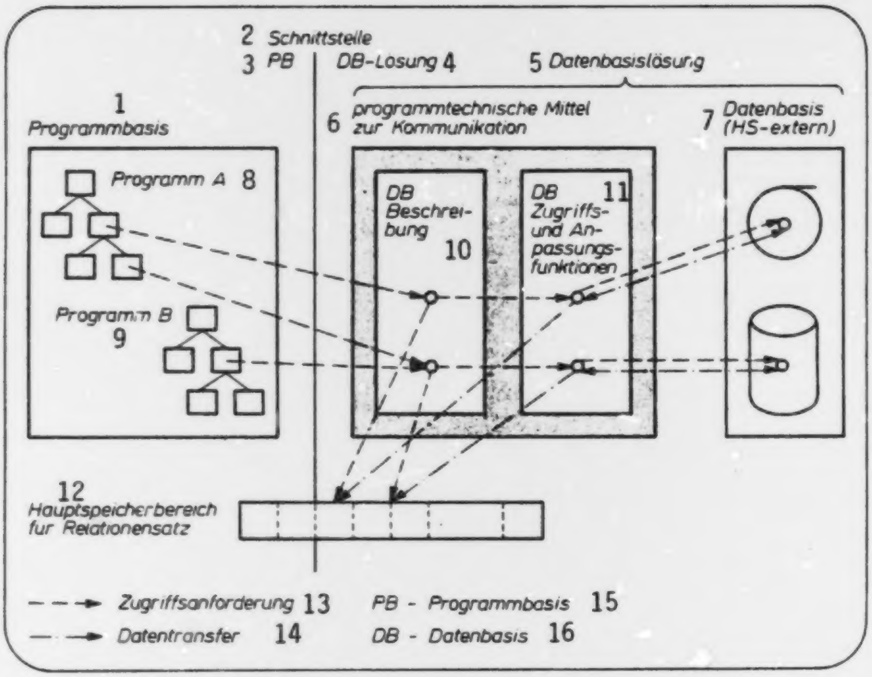
2 Schnittstelle
3 PB
DB-Lösung 4
5 Datenbasislösung
1 Programmbasis
6 programmtechnische Mittel zur Kommunikation
7 Datenbasis (HS-extern)
Programm A 8
DB Beschreibung 10
DB 11 Zugriffs- und Anpassungsfunktionen
Programm B 9
12 Hauptspeicherbereich für Relationensatz
Zugriffsanforderung 13
Datentransfer 14
PB - Programmbasis 15
DB - Datenbasis 16

Figure 4: Interface Program Base/Data Base Solution

Key:

1. Program base
2. Interface
3. Program base
4. Data base solution
5. Data base solution
6. Programming means for communication
7. Data base (main storage external)
8. Program A
9. Program B
10. Data base description
11. Data base access and adaptation functions
12. Main storage area for relation set
13. Access request
14. Data transfer
15. PB - program base
16. DB - data base

systematic appears in a separate volume of the handbook of the POS technology. This design process is not yet computer supported.

Program-Oriented Design

The following activities are described:

selection of the basic machine suitable for the programming solution
specification of their types and of the record and file structure
specification of data access
modularization
design of the test strategy
planning the organization sequence of implementation and test.

The documentation corresponds to the documentation systematics.

Implementation

The language-independent documents of the implementation comprise all regulations for the general sequence of the implementation, the general description of the programming means for implementing the communication level, and the standardized module documentation.

The language-specific documents of the implementation contain the user description of the specific programming means for the respective language. Because of the significance of implementation for understanding the POS technology, there are more detailed explanations on this point.

Relative to the product, the following can be implemented:

modules
programs
program systems
data base solutions.

Standardized working sequences exist to implement these products, which are supported by programming means.

Standardized Module Structure

In order to implement the modular design, a standardized modular structure is regulated (Figure 5).

Module Interface

Each module has an interface for module linkage. POST 1600 rigidly prescribes this interface. Various interface types are possible (in dependence on the desired convenience).

Structure of a Module

	Documentation part
	Interface part at the beginning of the module
Module Body	Data definition part
	Logic part
	Interface part at the end of the module
	Data part

Specification for the Interface Parts:

Specification of the module status:	Program (task) Control module/processing module
Specification of linkability:	Internal/external External
Specification of interface type:	With/without check
Specification of the formal parameters of the module:	Name, type, repetition factor
Specification of the called modules:	Name, current parameters
Type of storage space allocation:	Static/dynamic

Figure 5: Standardized Structure of a Module

Module Linkage

This can take place on the source or object level. The linkage can be coded with special language elements.

Logical Structures

The logical parts of the modules are programmed according to the rules of structured programming, corresponding to the structure-block concept of the POST 1600.

The general sequence of the implementation process is shown in Figure 6.

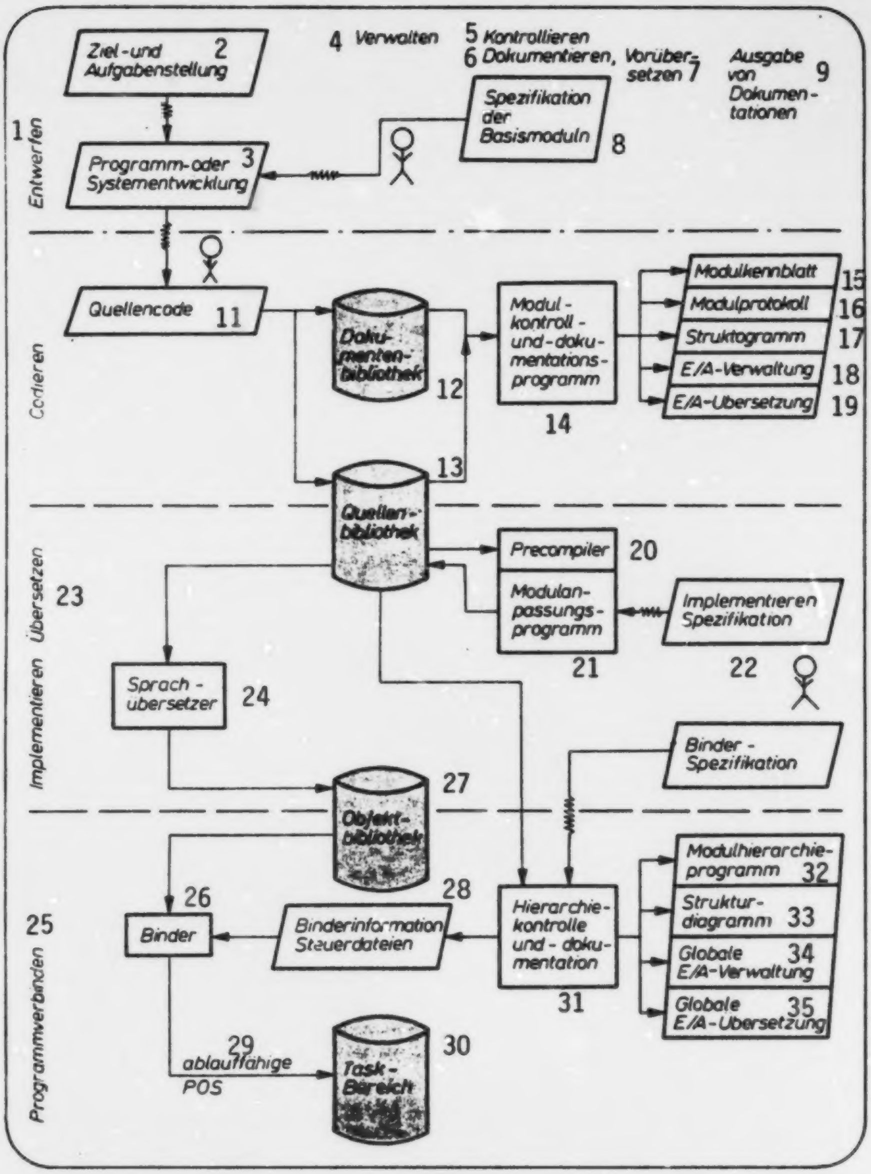
1 Entwerfen
Ziel-und Aufgabenstellung 2
4 Verwalten
5 Kontrollieren
6 Dokumentieren, Vorübersetzen 7
Ausgabe von Dokumentationen 9
Spezifikation der Basismoduln 8
Programm-oder Systementwicklung 3
Codieren
Quellencode 11
Dokumentenbibliothek 12
Modulkontroll- und -dokumentationsprogramm 14
Modulkennblatt 15
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Figure 6: Sequence of the Implementation Process

Key:

1. Design
2. Objective and task definition
3. Program or system development
4. Management
5. Checking
6. Documentation
7. Preliminary translation
8. Specification of basic modules
9. Output of documentation
10. Coding
11. Source code
12. Document library
13. Source library
14. Module checking and documentation program
15. Module identifier sheet
16. Module log
17. Structogram
18. I/O Management
19. I/O translation
20. Precompiler
21. Module adaptation program
22. Implementation of specification
23. Implementation of translation
24. Language translator
25. Program linkage
26. Linkage editor
27. Object library
28. Linkage information, control files
29. Runnable POS
30. Task area
31. Hierarchy control and documentation
32. Module hierarchy program
33. Structure diagram
34. Global I/O management
35. Global I/O translation

The Three Main Phases of the Implementation Process:

coding the draft in the selected programming language according to the regulations of the POST 1600

translating the source programs into object programs

linkage of object modules.

This sequence must be adhered to, since the next following phase is always based on the intermediate results of the preceding phase. The implementation is possible both according to a top-bound and according to a bottom-up mode of procedure.

The programming means of coding are made available in the form of macros for the macro-assembler language of the Robotron K 1600. Figure 7 provides an overview of the macro assortment of the POS technology.

Macro Assortment

Macros for interface
TS ANF - Implementation of the standard beginning of a module
TS INT - Description of data which are transmitted through the interface
TS END - Implementation of the standard end of a module
TS CALL - Call of a module, module linkage

Macros for logical basic structures of the sequence control
TS IF, TS WHIL, TS UNT, TS ZYKL, TS CASK, TS CASG, TS BREA, TS MAB

Macros for error treatment

Macros for the combining of internal data

Macros for desribing the data base
TS RELV - Linkage macro for integrating a data base description in a module
TS RELD Description of a relation
TS MERK Description of a characteristic of a relation

Macros for closing disk files

Object Modules

Module for input and output
Modules for converting data records
General object modules

Figure 7: Macro Assortment for Coding

With the higher programming languages, language instructions and associated precompilers fulfill these functions.

The coded modules are checked with the programming means of the POS technology and are stored in libraries (source and documentation library).

Before translation with the compiler or assembler, the precompilers or macro-adaptation programs must be run through, and these have the following functions:

transformation of the language means of the uniform communication level into the carrier language

checking the source text for syntactical, formal, and structural correctness, and outputting corresponding module logs.

The prepared modules are translated with the compilers and assembler. The required source text libraries and user areas can be linked automatically. As a result, the object modules are stored in the object module library. Then follows the individual test of the modules.

During program linkage, the object modules are converted into runnable machine code. Only the highest module (top module) is always specified; all other modules are added automatically. The necessary input streams into the linkage editor are prepared by an auxiliary program. At the same time, a documentation of the module hierarchy is worked out.

The generated task-image files are stored in user areas and can be called by the operating system. Programming means of the POS technology control the entire sequence of the implementation process.

Testing

The documents on testing for POS K 1600 comprise the general principles and methods of function tests. A general technical sequence is set down as a regulation for the functional test (Figure 8).

This sequence holds for all types of the POS product (module, program, program system, data base).

Numerous test means are available which primarily support the test sequence according to the top-down mode of procedure.

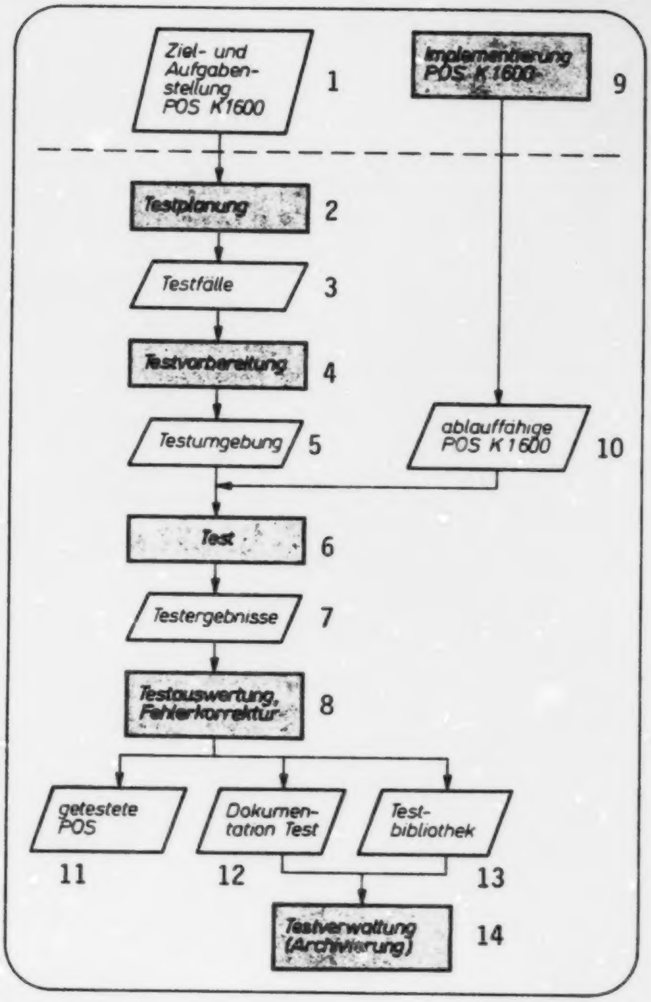

Ziel- und Aufgabenstellung POS K1600
1
Implementierung POS K1600
9
Testplanung
2
Testfälle
3
Testvorbereitung
4
Testumgebung
5
ablauffähige POS K 1600
10
Test
6
Testergebnisse
7
Testauswertung, Fehlerkorrektur
8
getestete POS
11
Dokumentation Test
12
Test-bibliothek
13
Testverwaltung (Archivierung)
14

Figure 8: Sequence During Testing
Key:

1. Objective and task definition POS K 1600
2. Test planning
3. Test cases
4. Test preparation
5. Test environment
6. Test
7. Test results
8. Test evaluation, error correction
9. Implementation POS K 1600
10. Runnable POS K 1600
11. Tested POS
12. Documentation test
13. Test library
14. Test management (filing)

3. Prefabricated POS of the Microcomputer System Robotron K 1600

These prefabricated POSs K 1600 are reusable program units, fabricated according to the POS technology, by means of which universal or frequently recurring POS functions can be solved when the Robotron K 1600 microcomputer system is used. Figure 9 gives an overview of the assortment of prefabricated POST K 1600.

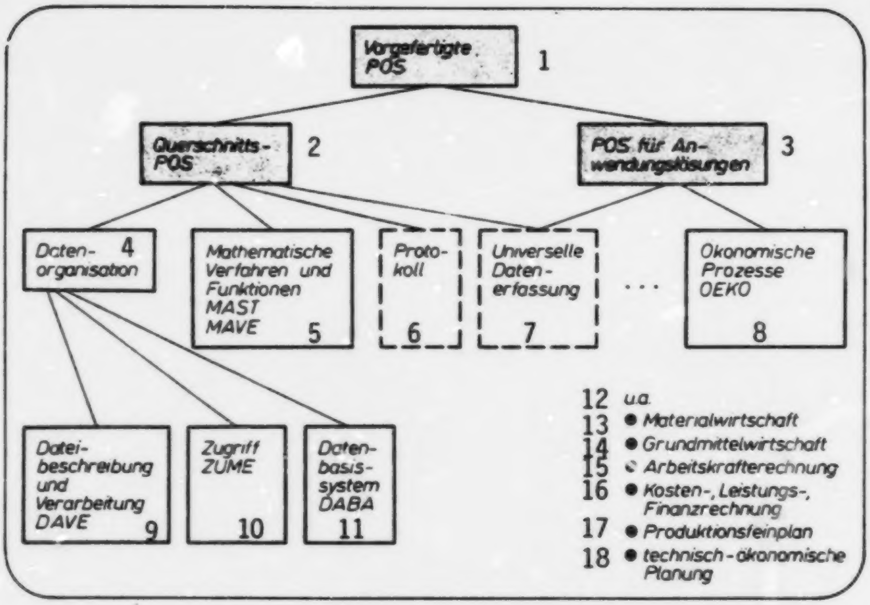
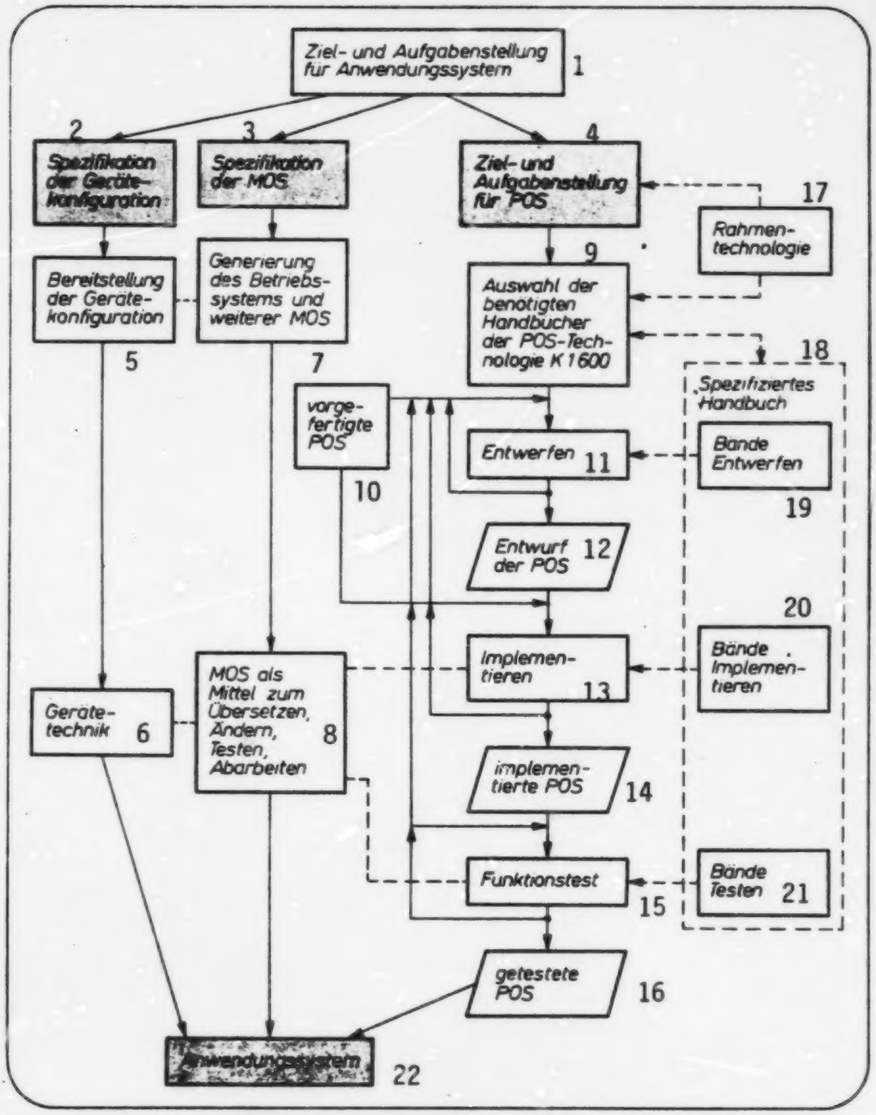

Vorgefertigte POS 1
Querschnitts-POS 2
POS für Anwendungslösungen 3
Daten-organisation 4
Mathematische Verfahren und Funktionen MAST MAVE 5
Protokoll 6
Universelle Daten-erfassung 7
...
Okonomische Prozesse OEKO 8
Datei-beschreibung und Verarbeitung DAVE 9
Zugriff ZUME 10
Daten-basis-system DABA 11
12 u.a.
13 ● Materialwirtschaft
14 ● Grundmittelwirtschaft
15 ● Arbeitskrafterechnung
16 ● Kosten-, Leistungs-, Finanzrechnung
17 ● Produktionsfeinplan
18 ● technisch-okonomische Planung

Figure 9: Prefabricated POS of the Microcomputer System Robotron K 1600

Key:

1. Prefabricated POS
2. Cross section POS
3. POS for application solutions
4. Data organization
5. Mathematical methods and functions, MAST, MAVE
6. Log
7. Universal data acquisition
8. Economic processes OEKO
9. Data description and processing DAVE
10. Access ZUME
11. Data base system DABA
12. etc.
13. Materials economy
14. Basic means economy
15. Work force calculations
16. Cost-, performance-, financial-calculation
17. Fine production plan
18. Technical-economic planning


Ziel- und Aufgabenstellung für Anwendungssystem
1
2
Spezifikation der Gerätekonfiguration
3
Spezifikation der MOS
4
Ziel- und Aufgabenstellung für POS
17
Rahmentechnologie
Bereitstellung der Gerätekonfiguration
5
Generierung des Betriebssystems und weiterer MOS
7
9
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18
Spezifiziertes Handbuch
vorgefertigte POS
10
Entwerfen
11
Bände Entwerfen
19
Entwurf der POS
12
20
Implementieren
13
Bände Implementieren
Gerätetechnik
6
MOS als Mittel zum Übersetzen, Ändern, Testen, Abarbeiten
8
implementierte POS
14
Funktionstest
15
Bände Testen
21
getestete POS
16
Anwendungssystem
22

Figure 10: General Sequence for POS Development

Key:

1. Objective and task definition for application system
2. Specification of the device configuration
3. Specification of the MOS
4. Objective and task definition for POS
5. Furnishing the device configuration
6. Device technology
7. Generating the operating and further MOS
8. MOS as means for translating, changing, testing, processing
9. Selection of the required handbooks of POS technology K 1600
10. Prefabricated POS
11. Design
12. Designing the POS
13. Implementation
14. Implementing the POS
15. Function test
16. Tested POS
17. Framework technology
18. Specified handbook
19. Design volumes
20. Implement volumes
21. Test volumes
22. Application system

4. Working Sequence of POS Development by the User

The following basic configuration is required for the POS-K-1600 development by means of the POST 1600:

a K 1620/K 1630 with at least 32 K words working storage
an operating unit
two cassette disk memories
a printer
a cassette tape unit or a paper tape unit
the operating system MOOS 1600.

Figure 10 shows the general sequence of POS development by the user, using the MOS, the POS, and the POS technology.

The VEB Combine Robotron handles the marketing of the manual of POS technology. The POST 1600 can also be used on the computer systems of the SKR (State Committee for Nonmetallic Raw Material Reserves), which are compatible with the computer system Robotron K 1600. The RD (Rechentechnik/Datenverabeitung) supplement 3/1980 gives further references to the POS technology.

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HUNGARIAN RESULTS IN TECHNICAL REALIZATION OF TELETEXT, VIEWDATA

Budapest MERES ES AUTOMATIKA in Hungarian Vol 29 No 6, 1981 pp 206-211

[Article by Sandor Klein and Lajos Nobik, ORION Radio and Electrical Enterprise]

[Excerpts] The Teletext and Viewdata systems are spreading increasingly over the whole world. This article provides basic technical information and describes the possibilities of hardware realization. The last section of the article discusses the current development status in Hungary and outlines Hungarian application.

Results of the Technical Realization of Teletext and Viewdata in Hungary

Experts have followed developments carried out at the BBC and IBA companies ever since the promulgation of the first draft standard for Teletext. The OMFB [National Technical Development Committee] coordinates and directs the theme. Matters related to realization in Hungary were examined in the analytical study entitled "Domestic Application Possibilities of TV Data Systems," published in 1978. The RTV [Radio and Television Section] of BME [Budapest Technical University]-HEI [expansion unknown] took a major part in preparing the study and also in the research involved. A proposal was submitted for the realization of characters with diacritical marks for the Hungarian language -- a problem that has received no attention until then. The study also outlined the possibilities for the setting up of a Teletext editorial facility, and examined the interfering effects of the Teletext signal on program broascasting. In 1979, at the request of the OMFB, a study was prepared at the university on the construction of a microprocessor-based Teletext editorial terminal. Among the Hungarian manufacturers of TV equipment, ORION was the first to assess the requirements for the new system, which included major modifications of television equipment. A Teletext decoder board with the corresponding infrared telecontrol unit, made by Mullard, was installed in a color television receiver CT 451, as early as 1978, at BME-HEI RTV at the request of ORION. A static Teletext page generator was also prepared at the university for testing the decoder and its possible manufacturing control, also at the request of ORION. The page generator has the capability of inserting preprogrammed Teletext pages in response to a video signal. All decoder functions can be checked with the aid of these pages. As a result of further development at ORION, this page generator can now store 50 pages of fixed information (compared to 12 pages initially). In addition, several dissertations have dealt with this subject, which, in addition to clarifying various aspects of the theme, contributed to the training of the experts required for the introduction of this new technique.

The use of the Teletext system in education is investigated at the National Education Center (OOK) in Veszprem. There, a complete editorial system made by Aston permits the editing of Teletext pages.

The Hungarian Postal Service is seriously interested in the engineering aspects of Teletext transmission, and -- in cooperation with the university -- made a trial transmission in December 1980. We shall report on the results of this experiment at a later time. Both Videoton and ORION produced color television receivers for Teletext reception in the course of the experiment. With the aid of these receivers, the error percentage of the Teletext signal was evaluated in various geographic locations, and the kind of interferences on program broadcasting was investigated.

The Viewdata system also has major potential. At the request of OMFB, the university developed an experimental Viewdata terminal based on the ABC-80 microprocessor. As a result of the cooperation between ORION and the university, a decoder capable of receiving both the Teletext and Viewdata signals will be installed in a color television receiver in early 1981. At the same time, a "Teletest" test unit will be developed at ORION to carry out detailed checking of already installed Viewdata decoders.

Development of the computer network of Viewdata is obviously a major task. It is useful to know that there is enterpreneurial interest from two sources for this already.

Application Possibilities in Hungary

In Hungary, it is expected that the first use of the Teletext video transmissions will be in the field of education; both centrally transmitted and locally (at local Teletext centers) produced programs could contribute significantly in audiovisual training. A data recorder and an audiofrequency cassette with a small central Teletext data adapter could be particularly useful in this field; this would permit the prefabrication of full program packets for use at any place and any time.

The Viewdata system seems to be the better of the two for setting up a closed-circuit system. Many administrative problems could be simplified by its use. In Hungary, public administration would be a closed system where this could be implemented. The various regulations, laws, land-registry records, birth/death/marriage registry records, and other centrally administrable data could be handled and retrieved. By using a simple printer attachment, hard copies could be readily provided.

Teletext transmission for the general public has even greater potential.

In addition to broadcasting simple daily news material, weather forecasts, road reports, and timetables could be broadcast. Various schedules of entertainment events could be provided for those seeking ways to spend their free time. Various games could be broadcast via Teletext Fig. 5).

Commercials or specific product information could be transmitted; this would be of interest to commercial enterprises (Fig. 6).

Subtitles could be superimposed on various programs with Teletext to help those with hearing impairment. This would meet an existing social need. If this were provided, the involved individuals could enjoy television programs, while not creating a nuisance to those viewers who do not require the subtitles. The study of foreign languages would be facilitated by the superimposition of Hungarian text to foreign films, which could be broadcast with the original soundtrack. Teletext could supply the text.

With minor modifications, this system could provide news and the experience of an edited journal to blind persons. Visualization of ASCII characters on Braille typewriter is an already developed procedure. With the aid of a Braille typewriter coupled to the decoder memory, the requested page could be made to appear in a form in which blind persons could use it.

The Viewdata system could offer additional services for the general public. Contrary to the Teletext transmission, the number of stored pages is virtually unlimited in Viewdata; thus, instead of daily news bulletins direct connection could be established between the user and the computer, so that large amounts of information would be available for recall. By making use of this interactive capability, goods may be ordered after viewing of a commercial; and trips, theater tickets, and the like could be directly ordered.

Fig. 5. "Mastermind" television game
(an example of entertaining games)
[Figure not reproduced]

Fig. 6. An example of product-information The photographs were taken from the screen of an ORION CT 452 color television receiver; the TV newspaper pages were created with the Teletext generator described in the text. The black-and-white reproductions here cannot do justice to the real experience of viewing the original transmission.
[Figure not reproduced]

It would even be possible to establish message traffic among subscribers; for individuals with hearing impairment this could replace telephone communication. There is room for further development if a full keyboard is attached to the Viewdata unit. Using the domestic TV receiver as the display unit, a small computer could be created. Original user programs could be written and, in addition, user programs could be retrieved from the central memory. Easy training in computer technology could be provided in the same manner, by recalling various game programs.

Of course, an internal RAM memory of 1 K capacity would then no longer suffice; the addition of a cassette-type data tape recorder would be required.

Conclusions

The situation in Hungary differs from the situation abroad in many respects. Broadcasting of programs for the general public is likely to be preceded by the establishment of relatively small closed-circuit systems: The domestic conditions do not justify as yet the publication of a general-purpose television newspaper. Research and experimental work in Hungary is primarily based on the English Teletext system. Hungarian-language characters with diacritical marks can be realized in this system already, and special decoder integrated circuits are commercially available. In addition, this system is already in use in several countries. The Hungarian Postal Service deserves commendation for its efforts to clarify the technical prerequisites of transmission by means of experiments. However, an essential condition for a TV newspaper is the setting up of an editorial operation. This is delayed since there is nobody to take charge of it.

The possibility of realizing a Viewdata TV newspaper in Hungary is more remote. For example, it would be a very extensive task to develop the required software. Compared to the Teletext, the system requires the editing of much more extensive material, which necessitates the establishment of a very large organization. It is probably because of these reasons that those countries which use the Viewdata system, have purchased the licence for it.

It seems to us that, in spite of the existing difficulties, the advantages of a TV news service are so many that a way will soon be found in Hungary to realize a suitable system, and that we will be able to report on the successful completion of the experiments in the not too distant future.

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No. 717

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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29 September 1981

EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 717

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RESEARCH IN VARIOUS FIELDS OF BIOLOGY, ASSOCIATED AREAS, OUTLINED

Successes in Reproduction Biology

Sofia VECHERNI NOVINI in Bulgarian 1 Aug 81 p 4

[Article by Academician Kiril Bratanov, director of the Unified Biology Center of the BAN [Bulgarian Academy of Sciences]]

[Text] The 12th party congress faced Bulgarian biology with particularly important assignments. The special part of the report submitted by Comrade Todor Zhivkov, entitled "For a Systematic Implementation of the Party's Program for the Development of Science and Education" as well as the theses on the development of our economy in the Eighth Five- Year Plan set several important assignments to the science of biology. These assignments particularly apply to reproduction biology which studies the complex process of animal and human reproduction.

Modern research in this area made it possible to penetrate profoundly into animate nature on the molecular level and the level of molecular complexes, and to study the three basic regulators of processes in animate matter, the three systems--the nervous, hormonal and immunal and the effect of biologically active agents such as enzyme systems, prostaglandins, vitamins and other biological stimulators. This made it possible to study the processes of the reproduction, growth, development, metabolism, immunogenesis, reactions, productivity and others or, generally speaking, processes through which life is manifested in its great variety.

It is in this area that for more than 20 years the Institute of Biology and Immunology of the Reproduction and Development of Organisms has provided a number of works on the interpretation and guidance of the reproduction process. The main task now is to systematize the results of these studies and to convert them into technologies which will direct, control and intensify this process for the benefit of man. A proper recommendation was contained in the theses of the party congress on the extensive use of biogenic stimulators in agriculture. Hence the task of the institute's collective to study even more extensively the effect and effectiveness of the hypophysis, the gonadotropic and latatropic hormones, the ovarian hormones of the folliculine and protein groups, the placentar gonadotropic hormone, the disticular hormones, the prostaglandins, the hormones in the colastrum and many other natural biological substances which influence both the control of the reproduction process as well as the lactation, growth and development of the organism.

The development of a method for controlling immune processes in man and animals and the study of reproduction immunology is a major achievement of the institute.

Its purpose is to determine the mechanisms of immunosuppression and immunostimulation in connection with the developed methods for fighting the various forms of immunologically caused sterility and abortions and the development of methods and technologies for immunological sterilization.

For more than 30 years the institute has been yielding valuable developments in the area of reproduction immunology and has justifiably earned a leading position in global immunology studies. It is the seat of the International Committee on Reproduction Immunology and the organizer of the so-called "Varna Symposiums" on immunology. The Eighth Five-Year Plan includes the national coordination program "Control of Immune Processes in Animal and Human Organisms." This program coordinates and comprehensively combines all scientific units within the system of the Unified Biology Center of the BAN and the Medical Academy.

An important task based on the decisions of the 12th party congress, related to the biosynthesis of protein, is increasing meat production through the intensification of the reproduction process of sheep, cows, hogs and fish. The congress resolutions call for increasing the number of sheep and cows and for the full utilization of vegetal protein in the huge mountainous and semimountainous pastures. Unquestionably, this requires the even more extensive application of methods for the intensification of the reproduction process in sheep and cattle breeding.

The technologies under development for the impregnation of sheep at an earlier and later age, multiple births and impregnation of aborted sheep have been resolved from the scientific-methodical viewpoint. The difficulties in their application are mainly of organizational-administrative nature. Such difficulties must be eliminated. Currently, every year we are obtaining an additional 75,000 to 80,000 lambs or about 2.4 million kilograms of lamb even though far greater possibilities exist such as, for example, the additional impregnation each year of 600,000 older sheep. This is a major biological researve which must be used. The use of technology for creating twin births in cows, particularly in beef cattle, is a very important task.

Successful studies are being conducted for the transplanting of zygotes and ovarian cells. Offspring has been produced as a result of the transplanting of sheep zygotes kept frozen for 10 months and fresh cow zygotes. This method offers great opportunities for the full utilization of genetically valuable livestock.

Another important success achieved by the institute's collective is the development of methods for causing lactation in sterile cows and sheep. With about 20 percent sterility, every year the country has about 100,000 cows which yield no milk and are economically unprofitable to the cooperative farms. Lactation in such cows is restored through the technology developed by the institute.

Experimental studies of 560 cows in Silistra, Razgrad, Tolbukhin, Turnovo and other okrugs proved the great biological and economic effectiveness of this method. Cow lactation is being restored and, on the basis of genetic factors, 20 to 25 liters of milk per cow have been achieved. At the APK [Agroindustrial Complex] in Razgrad, the cow Oma yields 35 liters of milk daily.

In Silistra Okrug alone, as a result of the application of this method, an additional 600,000 liters of milk will be produced; on the scale of the entire country, several dozen millions of liters will be produced. We anticipate that by the end of this year 10,000 cows will be treated with our method.

A very important task based on the decisions of the party congress is the development of a technology for the freezing of ram sperm in such a way as to lead to a new organization of artificial insemination in sheep breeding, which would save several million leva. The institute has a big collective of more than 30 scientific workers from several scientific workers from several scientific units within the system of the Bulgarian Academy of Sciences successfully working on this problem. We are increasingly expanding the use of the hormonal method for the one-time egg-laying in carps. This year the use of this method will yield more than 15 million young carps. However, the biological potential is far bigger.

The application of the successes achieved in the field of reproduction biolgoy is an indicative example of how biology must serve life and the people.

Docent Dano Danov and Engineer Dimitur Popov at work with an electron microscope.

Activities of Molecular Biology Institute

Sofia TRUD in Bulgarian 3 Aug 81 pp 1-2

[Interview with Academician Rumen Tsanev, director of the Molecular Biology Institute of the BAN, conducted by Tanya Kondakova]

[Text] Many changes have taken place not only in the structure and content of science but in its sociopsychological aspect as well since the already distant times when science in our country stopped being the hobby of individual "elect" people and became a mass, a socially necessary profession. It is as though this lofty realm of spiritual activities dropped from inaccessible heights, with its vague hopes for a better future, and began to be assigned quite immediate tasks based on current needs. That is perhaps the reason why the term "scientific worker" became so widespread. Something seemingly paradoxical resulted: the increased role of the scientific worker in society made the role of the individual in science almost unnoticeable!

Could this be the reason for which because of the fast growth of the forest we are no longer able to see the individual trees clearly, and for looking more at accomplishments than at their authors and more at the objectives and results than at the approach and the road to them--the blend of criteria, assessments, requirements and inner motivations which constitute the so-called value orientation of the scientific personality. For this reason, let us walk in the opposite direction, from the human component in science to its specific accomplishments.

From the journalistic viewpoint Academician Rumen Tsanev cannot be considered an "easy" scientist (if such exist at all!). However, this makes communicating with him the more rewarding.

[Question] Academician Tsanev, I suggest that we begin with a question of a psychological nature. Do you share the concept that "great ideas are born of a great feeling rather than a great mind," or, in other words, that in the creative process the scientist relies more on his intuition and imagination?

[Answer] Yes, but intuition is nothing but subconscious experience which comes to the trained minds only. In addition to knowledge, however, one needs talent in order to achieve the very necessary subconscious connections which will lead to an original idea or solution. I have always claimed, on the basis of my own experience, that it is an absolutely necessary prerequisite for the scientist to have a scientific imagination, to be able to envision undiscovered and previously unseen things and phenomena. The formulation of new hypotheses is sometimes risky also because of the reaction of those around us. I have occasionally cited the example of Niels Bohr who, when asked about the success of his school of thought, answered: "We were not afraid to look silly."

Therefore, yes to imagination. However, this is not a self-seeking consideration which borders on ignorance....

[Question] The increased social role of science moved the front end of the battle for new knowledge to the research collective. Actually, what does the collective method of work mean? Does it always enable the individual to express himself most fully or, nevertheless, is it necessary to give preference to the "mind which thinks alone?"

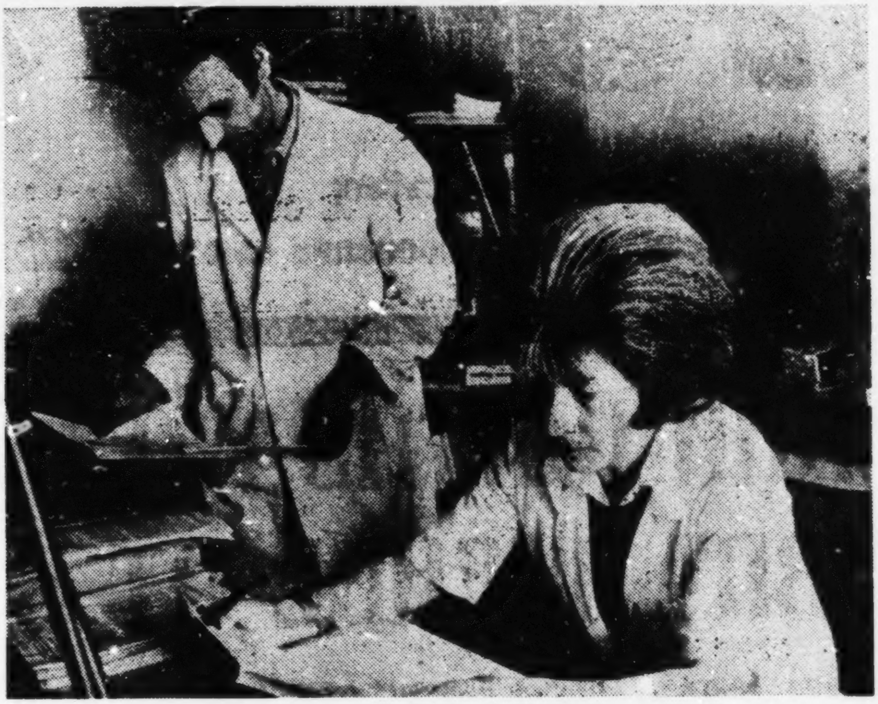
[Answer] Bearing in mind the rapid development of contemporary science, when a great deal of time is required to keep up with extensive publications and to engage in extensive experimentation with the comprehensive interpretation of results it is virtually impossible for a person to work alone, it is simply not within his power. Before undertaking an experiment, for example, we must begin by formulating the problem accurately. We must then develop the blueprint which will be followed in its solution and the specific technical method. In the course of this process every member of the collective can and must participate either by suggesting a good formulation of the question or a specific original solution, a valuable correction or display of experimental skill.

No, the collective method does not hinder the display of individual creativity! It is true that a certain equalization is obtained and the individual contribution may not be always identified on a percentage basis. It is also true that the weak specialist may develop along the more capable ones. In the final account, however, the leading figure becomes eventually identified and earns a reputation by adamantly pursuing and resolving a given problem.

As to thinking, scientific thinking, it always seems to me that rather little time is being assigned for this, for objective and subjective reasons. Whenever I see a scientific worker who keeps working on and on I feel like asking him, as Rutherford used to: "When do you find time to think?..."

[Question] Being engaged in the performance of two functions--scientific research and organization--what do you think: are some employee criteria suitable to the work of the scientific worker? What is it that "erodes" his time budget?

[Answer] I shall answer you by citing the results of an investigation conducted by the International Federation of Scientists. "How long can a scientific worker be productive?" was the question. The answer was the following: "Until he becomes an administrator." Administrative work, fruitless meetings, which are quite abundant with us, a great deal of paper shuffling and bureaucracy are the most terrible enemies of scientific creativity. Add to this the time regulation of the length of the day and the work--which are absolutely unsuitable in this case--the picture becomes clear. Yet these are stipulations designed by people. Therefore, in our effort to fight them we are actually fighting people.



The collective method does not hinder individual creativity. The photograph shows biologist Emiliya Khristova and Lyuben Marekov, a chemist at the Molecular Cytology, working jointly on an institute's project.

Bureaucracy has found its way even in material procurements, something which affects research directly. Any delay in supplies (or simply their unavailability) or the servicing of scientific equipment entails not only unpleasant consequences and distracts our attention but lets us fall behind global developments in this area!

[Question] What is your view on the possibility of planning extensive new developments in basic science? Is this not one of the means for avoiding work on petty topics and waste and for stimulating creative activeness?

[Answer] Who says that science cannot be planned? It is only discoveries that cannot be planned, as to scientific projects, naturally, with determined objectives and effectiveness, must be mandatorily coordinated on a planned basis and financed, thus mobilizing the creative potential of a given collective. At this point the role of the manager and his ability to choose and insist on a topic, in accordance with the important and interesting suggestions of his colleagues, and to surround himself by good cadres, by critical minds, comes to the foreground. Sometimes the reason for poor work should not be hastily sought in poor organization, before the suitability of the cadres concerning a specific task has been determined.

[Question] In a field such as yours, which is new, significant and puzzling, unquestionably "noble curiosity" is the primary, the guiding reason. However, in our time social practice as well expects results from pure knowledge. Is there, nevertheless, still a place for antagonism between it and, let us say, the academic career of a young scientist?

[Answer] The following statements by Louis Pasteur are inscribed on the Palace of Discoveries in Paris: "There is no basic or applied science. There is only science and its application in practice." I too consider such a division entirely wrong. Every scientific worker today is motivated, in addition to his desire to unravel the secrets of nature (or at least should be motivated), by the desire to accomplish something useful to others. However, where is the perfect mechanism which will enable the scientist to participate in applied work, and which will force the interested departments to engage in the application of results? I have the feeling that sometimes, in order to see one's development implemented, one should involve as his co-author the person on whom this depends. This circumstance forces many scientific workers to prefer conventional work to the headaches of promoting application....

[Question] Marx expressed the thought that all suspicion and all baseness must be left at the door of science. In your view, what should be the leading, the determining feature in the moral behavior of the scientist?

[Answer] The cult of scientific truth! This calls for honesty and self-exigency and the ability to acknowledge failures and tolerate outside criticism. Furthermore, the true scientist always seeks the criticism of his colleagues in order to be able to check the direction and the purpose of his searches. Sometimes even his best associates will disagree with him and will thus help him to find the scientific truth.

As to the morality of the scientist, I find it difficult to tolerate the fact that some of our scientific managers (who hold this position by virtue of their social status) benefit from other people's work and develop conflict situations involving those who dare to argue with them. These are people who have accidentally assumed positions in the difficult and responsible field of science!....

[Question] What is your view on Mayakovskiy's warning that "unless we put a humanistic muzzle on science it may bite man....?"

[Answer] Do you mean by this the moral responsibility of the scientist? Yes, in an area such as ours it is indeed very big. Ever since the nature of the gene was discovered and possibilities were developed of manipulating it the fear has developed of a misuse of so-called gene engineering. However, it is a question precisely of the deliberate focusing of scientific achievements to work against man rather than the danger which such achievements may encompass. That is why, without reducing their vigilance or prematurely setting their civic conscience to rest, scientists throughout the world are continuing their research in this area, for it is vitally important to all societies and because it will yield discoveries of great practical value to mankind!....

Progress in Molecular Biology

Sofia TRUD in Bulgarian 4 Aug 81 p 2

[Article by Tanya Kondakova]

[Text] Once, objecting to Academician Oparin's stipulation that in biological systems new biological laws which assume priority and main significance in the further development of animate beings may appear, in addition to familiar physical and chemical laws, one of his opponents exclaimed: "Poor molecule! What would it do in such a case? What laws would it obey, physical or biological?"

I reminded Academician Rumen Tsanev of this semianecdotal case and asked him, taking it as an introduction, to raise a bit of the curtain behind which hides the secretive, revolutionary and very promising science known as molecular biology. However, in the same way that his colleagues found it difficult to explain the code with which genetic information is translated from the language of nucleic acids to that of proteins, he finds it difficult to give us a popular "translation" of research and discoveries in this area in order to avoid oversimplification!....

He is assisted by his innate ability to think in both concepts and images and by his wit: "Does the very name of the science not reveal that we are dealing with the organization of life on the molecular level? The point is that we are studying not any type of molecules whatever but the complex, the gigantic molecules, which are also known as biopolymers, thanks to whose appearance matter made a quantum leap from the inanimate to the animate."

It is infinitely tempting to enter the delicate, streamlined and incredibly varied world of biopolymers through the entertaining story of the scientist, as though modeled by a wasteful master craftsman--nature; and to find out that proteins and nucleic acids have their own "alphabet," and that the unique individuality of each organism is determined also by the order in which their "letters"--their building units--are arranged. "With the DNA molecule, the material carrier of heredity," Academician Tsanev said, "nature has developed an amazing method for the coding of information, as yet unreached by human technology. For example, information on an individual is encoded in a nuclear cell invisible to the naked eye. If we were to attempt to record it in writing we would need about three million regular-sized pages!"

Molecular biology means the practice of biochemistry without a license: this is a rather popular joke among scientists in this field. Academician Tsanev added that the science was developed by physicists: what better proof of the beneficial alliance among the various fields of science! I recall the strong interest which was triggered several years ago at home and abroad by the results of his joint work with Academician Blagovest Sendov. Their successful experiment in mathematical modeling of the regulatory mechanisms of cellular multiplication earned them the Dimitrov Prize and... the original assumption that the cell contained not only genetic but other types of information as well, a program according to which a given organism will develop.

Could it be that it is precisely Bulgarian science that is about to make a substantial contribution to the unraveling of one of the great and exciting secrets of life? Its leading representative in this area does not give a hasty answer to the question (restraint is a characteristic feature of the true scientist). At the same time, however, he does not conceal that the hypothesis has been supported by a number of experimental proofs and that it is the main axis around which basic research of the collective he leads rotates....

Topic: "Scientist, Collective and Practice," at the Institute of Molecular Biology of the BAN

More experiments, vigil, tremendous patience and persistence are needed. Irina Tsaneva, a biologist, is observing biopolymers and their complexes with an electron microscope.

Actually, from the very first of the several days I spent at the institute I fell in the midst of the feverish "search for new additional proofs" which possesses every scientific worker. Such proof does not come in 1 or 2 days or a week. It requires more and more experiences, vigils, tremendous patience and persistence, for the instant of joy given by success may prove to fleeting and misleading, while untruth in science does not benefit anyone and is inadmissible. I saw this with my own eyes, through the excitement which was triggered by the experiments initiated in our country for the development of so-called hybridomes which produce specific antibodies. I saw this with the microscope. The personnel, who were watching them from morning until night, cautiously said that it was still early for the end result, which would appear only on the 24th day. I also witnessed the strict but just rebuff of an otherwise conscientious technician who had taken defective photographs of cell nuclei. No one, however, thinks of being insulted or of apologizing....

Such are the "ordinary" details which fill a day of research aimed at reaching the depth of the microworld. This is nothing new. In this case, however, it is an indication of the long road which must be covered to the point of a scientific publication which would contain original features and would represent a substantiated contribution rather than simply a skillful compilation of familiar truths.

I emphasize this, for according to data of a statistical study conducted by the BAN Scientific Information Center, the works of the personnel of the Institute of Molecular Biology are the most frequently mentioned achievements of Bulgarian science and because it is precisely here that the qualitative characteristics rather than the number of publications are the criteria in assessing the work of the individual scientist. Such work is assessed publicly. At meetings of management and scientific councils the criticism of creative scientific work has been raised to a cult. This already established style of work is known to and supported by everyone. Is it astounding, therefore, that in this institute there is no need to publish a "house" periodical as is practiced by so many other institutes, and that the collective has boldly and openly gone straight to the international "market," and let others, impartial observers, to assess our work instead of doing it ourselves "at home"...

The results are found in the external features, in the fact that the members of the collective are frequently asked to present papers at international congresses and symposiums (at the time of my visit several such requests could be read on the bulletin board in the hall). It is found, most of all, in the content of the developments themselves. For example, it is no accident that it is precisely the Bulgarian institute that was assigned to coordinate the work on the topic of "Chromatin Structure and Function" within the framework of cooperation among the academies of sciences of the socialist countries. Its laboratories were the first to undertake the clarification of the complex mechanism of the so-called replication (duplication) of the genetic apparatus of superior organisms in order to establish the means through which gene activities are controlled. As we know, this determines the functioning of the cell and, respectively, of the organism. The latest data obtained by the institued were awarded the "Professor Asen Zlatarov" prize and research in this area is continuing.

A report on the latest achievements of the collective sheds light on other unraveled puzzlements of animate matter:

Some characteristics have been discovered in the organization of the DNA of superior organisms. This is a major contribution to understanding the evolutionary mechanisms;

The factors which control the means through which the ribosoma are formed in yeasts and animal cells have been studied. This is of essential importance in the synthesis of proteins and of growth of normal and cancerous cells (Professor Asen Khadzhiolov, the head of the study group, was awarded the 1980 Dimitrov Prize);

New methods were developed for the study of nucleic acids and chromatin with a more effective and more intensive description of the molecular organization of the cell (applied in Bulgarian and foreign laboratories).

According to statistical data at the institute the average age of a scientific worker and specialist here is 39. In science this is considered young. In this case, however, it also means that there is a substantial number of young scientists. I asked one of them, Oleg Georgiev, of how the young felt. "Oh, people here are not divided into young and old," he exclaimed spontaneously. "We are considered full-fledged scientific workers. Along with the "seniors" we participate in publications and discussions. We are sent along with the others to specialize or attend symposiums. If I were asked about the conditions I would prefer to insure my growth as a specialist I would unhesitatingly name those prevailing in our institute...."

Do not think that this was a means for flattering the management. The young man expressedly cautioned me against such an interpretation. Furthermore, for some reason, throughout my stay in the institute I kept thinking of the old classical schools headed by noted scientists, about which we have read, in which the famous distance which separates the professor from his assistant is shortened by itself through frankness, humor, charm and human contacts....

Actually, a jocular inscription hangs on the door of the director's office, in English: "Take care of your boss for the next one may be worse!" This sounds quite unacademical, does it not?

Bureaucratic Difficulties

Sofia TRUD in Bulgarian 5 Aug 81 p 5

[Article by Tanya Kondakova]

[Text] You are probably familiar with the legend of the mythological ancient Greek beauty who opened a box of ills which spread throughout the world, despite Zeus' ban. They included diseases. Medicine is still helpless against some such scourges, for their nature is concealed either in still unraveled mechanisms of heredity or in the molecular mechanisms which control cellular division of superior organisms.

Once again we come to molecular biology. Apparently the hope for complete and unthreatened human health is in molecular biology. We do say that the real, rather than the imaginary, future is prepared as of today, gradually, step by step, with the laying of stable foundations on which the framework of guaranteed health is built....

As I realized after several conversations in the institute, such an understanding of the direction of the efforts here is neither sporadic nor deliberate! It is not a question of a pragmatic approach to each research topic (this would be a vulgar simplification of the very essence of science), but nor is it a question of an arrogant attitude toward the concept of "application" which is still shared by some academicians. That is why I was not surprised in the least to come across the section entitled "Applied Results" among the reports submitted by the institute. Consequently, it is a question of strategy, of policy in the work of an institute.

The first example: until recently we spoke mainly of the prospects and fantastic possibilities offered by gene engineering. Today it has assumed an emphatically practical direction in the institute's structure. Its head, Professor Kalcho Markov, showed me precisely the searches and accomplishments in this area. Their purpose? "To develop new microorganisms through the transfer of hereditary material from one microbe to another." The first project has already been completed and is ready for submission to the Institute for Infectious and Parasitical Diseases and from it to clinical practice. This is a highly productive serum produced from the toxin of the intestinal bacterium, from which antitoxin serums can be created and thus treat severe diseases in children and young animals.

Second example: with the help of an immune reaction the personnel of the same section were able to discover a disease caused by carnation seeds contaminated by a specific virus. The method for the discovery of the disease and the decontamination of the seeds was applied last year and resulted in savings of about 150,000 leva. With the cooperation of Professor Evgeni Golovinski a method was developed and applied for the determination of a mutagenic and cancerogenic effect of chemicals syntehsized in the institute. However, it could be applied by any laboratory and enterprise of the chemical industry which discards chemicals in the water and the soil unaware of their danger to man. This is a problem of vital importance work on which is being done throughout the world.

Third example: recently experiments were undertaken by specialists in the field of gene engineering on the fixation of nitrogen from the air. This is another global problem with a more distant yet strategic objective. As we know, this is done only by microbes. The first basic target of the Bulgarian experimental scientists is to isolate the genes of the microbes and to develop new soil-enriching microorganisms. The more distant and quite alluring prospect is to introduce these genes in the plants in such a way that they may begin to fix the nitrogen from the air by themselves. This seems fantastic yet it is not impossible....

Fourth example: after extensive studies and experimentation the collective of the Chemistry and Biochemistry of Antimetabolites Section, headed by Prof Evgeni Golovinski, was able to synthesize several original chemical compounds--analogs with suppressing effect on the growth of malignant cells. The antitumor effect was confirmed several years ago at the Oncology Institute. Some of the researchers were awarded the "For Contribution to Technical Progress" badge; 15 authorship certificates were issued and 8 or 9 patents were granted. However, the clinical application is still at the stage of expectation and wishes. Scientific Associate Sotir Zakhariev, who defended his candidate dissertation on the same topic, supported with figures and facts his views on the reasons for the delay. Briefly stated, according to the international instruction on such tests, the stumbling block was that the toxicological studies had to be made with big animals, dogs in this case. The dogs had to be of a special breed. However, to this day the necessary number of such dogs has not been procured. Because of its low capacity, the base at Aldomirovtsi Village was unable to procure such animals and, for the same reason, the NIKhFI [Scientific Research Chemical-Pharmaceutical Institute] could not carry out the experiment despite its commitment. It is true that the project investor, the Farmakhim DSO [State Economic Trust] had decided to build a breeding center. However, "can he imagine how long this will take?" S. Zakhariev asked rhetorically. The result is a magic circle or the not entirely expedient alternative of conducting the tests abroad....

I discussed the matter with the director, Academician R. Tsanev. Quite readily he took up the subject of the "sluggish motion of the bureaucratic machinery" and of "outside obstructions." Once again, for the umpteenth time, he emphasized the need for the Bulgarian Academy of Sciences to have its own import and supply center. He cited other examples of postponed or "blocked" utilization of individual achievements, again for the same reasons. He also discussed a very important and obviously quite thoroughly considered project related to the manufacturing of antibodies in cell cultures, which would attack virul infections and some forms of cancer. "We have all the necessary forces and conditions" for the production of interferon, the name of the pharmaceutical which was recently synthesized, "if the project is financed."...

In the several meetings we had, I rarely saw Academician Rumen Tsanev relaxed behind his desk. I followed him in his constant visits from one laboratory to another, checking on the course of one experiment or another and, frequently, watching the experiment himself, listening to assessments and suggestions and giving advice or instructions. I had the feeling that he knew what was happening at every single minute in the test tubes, the nutritive media, and the other research facilities. If he was not in his office (which was far smaller and simpler than that of a director in an economic enterprise, for example), he was with one or another associate, discussing a specific, a very specific scientific problem. We were able to talk only intermittently. However, he was able to fill these short and scattered moments with maximum information and meaning. I saw him smiling, annoyed, concentrated, excited or angry. I never saw him totally pleased!

It became clear to me why he had found the best possible description of the scientist in Goete's Faustus....

Until recently we spoke mainly of prospects and possibilities of gene engineering. Today the Bulgarian scientists have scored achievements. The photograph shows Biologist Zoya Katurova and Chemist Emil Nikolov at the Polymer Physics Laboratory.

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CONDITIONS FOR INCREASED USE OF PLASTICS IN MECHANICAL ENGINEERING DESCRIBED

Prague STROJIRENSTVI in Czech No 4, Apr 81 pp 224-229

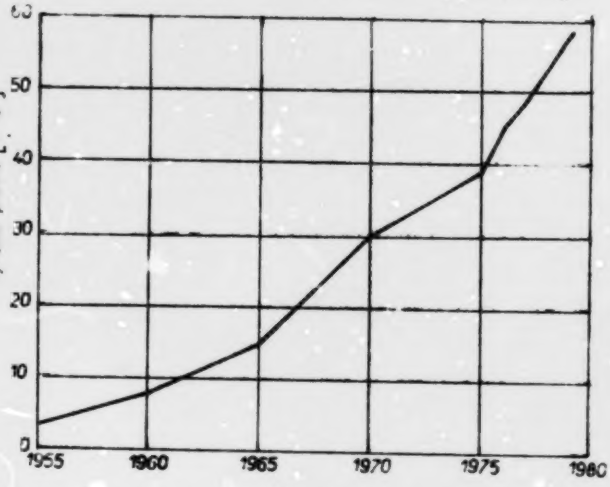
[Article by Eng V. Landa, CSc, State Research Institute of Materials, Prague: "Increasing the Use of Plastics in Czechoslovak Mechanical Engineering"]

[Text] The author presents important information on the working and use of plastics in Czechoslovakia's mechanical industry and gives a critical evaluation of the disproportion which has arisen between an increased output of plastics at the end of the last five-year plan and limited plastics-working capacities in the mechanical industry as a whole. The analysis shows that important shortcomings which are emerging have led to the current contradiction between support for plastics production and the use of plastics in the mechanical industry.

The importance of plastics and the extent of their use in all sectors of the national economy are growing steadily. The increase in the output of plastics worldwide continues to be extremely rapid (Fig. 1), currently amounting to almost 60 million tons a year. In making a comparison with the output of metals, we must take account of the fact that volume for volume, plastics weigh a third to a fifth as much as metals.

Nor will the output of these materials decrease in the future, because practically no sector of industry can do without them. Moreover, an extremely important reason for their use under current conditions is the small energy requirement for their production compared with metals, as shown in Fig. 2.

Concerns that the output of plastics might fall as a result of exhaustion of supplies of petroleum, which to date has been the main raw material for their production, have been ill-founded, because currently only about 3 percent of the world petroleum output is used for the production of plastics. Furthermore, plastics production is not solely dependent on petroleum as a raw material: considerable quantities are produced from natural gas, coal, plant materials and the like, but thus far these sources have not been sufficiently developed to make them economically preferable.



Obr. 1. Růst světové produkce plastů za posledních 25 let

Fig. 1. World output of plastics in the last 25 years.

With the implementation of the decrees of the 14th and 15th CPCZ congresses, the plastics production situation in Czechoslovakia has improved markedly, as can be demonstrated by data on the production, import and export of plastics (Fig. 3).

The current per capita output of plastics here is about 60 kg, which puts this country in a leading position worldwide (ahead of Japan, France and the United Kingdom). The expansion of plastics production in Czechoslovakia will continue in the Seventh Five-Year Plan.

Worldwide, plastics have come to play a significant role in mechanical engineering and metalworking. The cost-effectiveness of their use is indicated by some of the technical and economic advantages they offer, such as a favorable strength-to-weight ratio, their potential for optimum design (e.g. integration of components), their long lifetimes resulting from the chemical resistance of the materials used, their improved use properties under more demanding operating conditions, the increases in labor productivity resulting from the use of mechanized and automated plastics-working procedures and the like.

For example, the labor input required for 1 ton of plastic machine parts is about 64 percent less than that for metal parts, while the production cost is 43 percent less. The weight of the product is a quarter that of steel items and a fifth that of nonferrous metals. Production of parts using plastic instead of metal yields a saving of about 85 percent on electrical energy.

Key:

POM--polyoxymethylene

mPPO--modified polyphenylene oxide

PA 6--polyamide 6

PA 66--polyamide 66

UP--unsaturated polyesters

PC--polycarbonate

PMMA--polymethyl methacrylate

PP--polypropylene

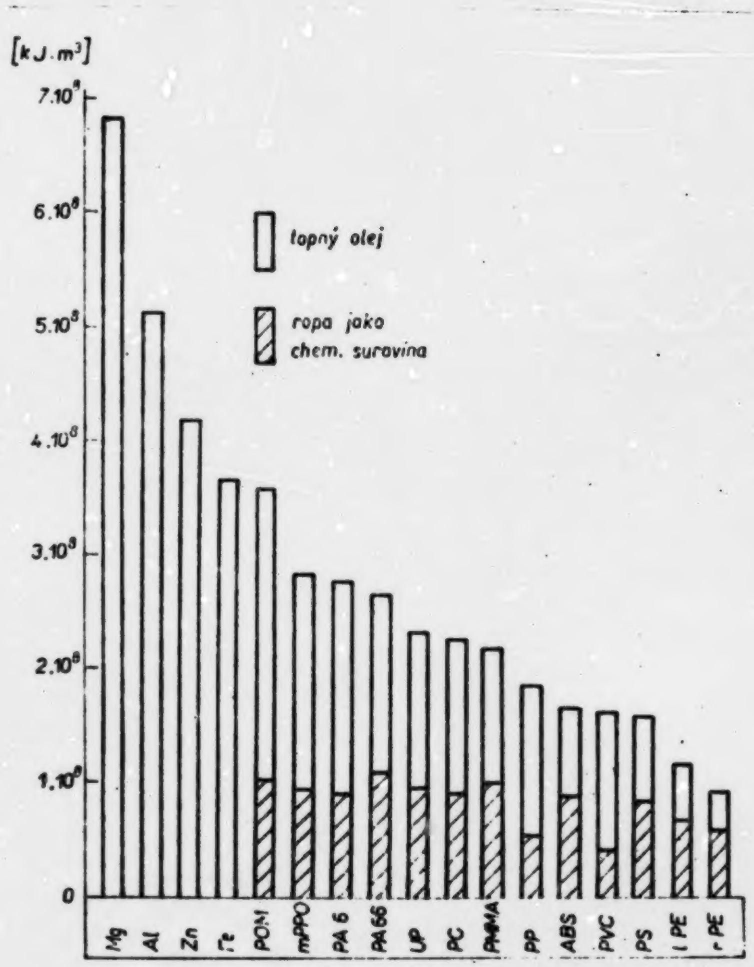
ABS--acrylonitrile-butadiene-styrene resin

PVC--polyvinyl chloride

PS--polystyrene

lPE--linear polyethylene

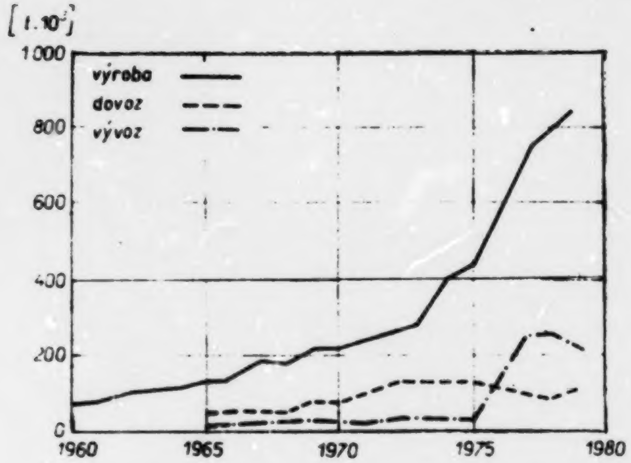
rPE--branched polyethylene



Obr. 2. Spotřeba energie na výrobu 1 m³ uvedených materiálů (u plastů včetně spotřeby ropy jako suroviny)

POM — polyoxymetylén
m PPO — modifikovaný polyfenylénoxid
PA 6 — polyamid 6
PA 66 — polyamid 66
UP — nenasycené polyestery
PC — polykarbonát

Fig. 2. Consumption of energy in the production of 1 m^3 of various materials (including petroleum used as raw material in the case of plastics).



Obr. 3. Trend výroby, dovozu a vývozu plastů v ČSSR za období 20 let

Fig. 3. Production, import and export of plastics in Czechoslovakia during the last 20 years.

Obviously these benefits are of great importance for the Czechoslovak mechanical industry, which has extensive possibilities for the application of plastics in its key product selection. Recent research indicates that the mechanical engineering divisions of production organizations in FMHTS [Federal Ministry of Metallurgy and Heavy Engineering], FMVS [Federal Ministry of General Engineering] and FMEP [Federal Ministry of the Electrotechnical Industry] are consuming about 160,000 tons of plastics a year. In general their use is centered on the following production areas:

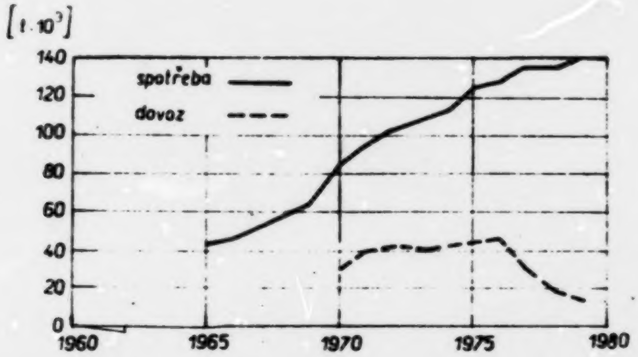
simple machine products	28.9 percent
high-voltage electrical engineering	31.2 percent
formed machine parts	9.8 percent
highway vehicles	6.7 percent
low-voltage electrical engineering	3.3 percent
chemical and foodstuff machines	1.4 percent
measuring devices and office machines	0.6 percent
consumer machines	9.4 percent
other	7.5 percent

Consumption by the mechanical sector accounts for less than 20 percent of the total quantity of plastics and plastic semifinished products available in the national economy. This finding is in sharp contrast to trends in the industrially advanced countries, where these industries account for about 35 percent of plastics consumption, especially if we bear in mind that since 1970, while the output of domestically-producted plastics has increased, the percentage of them used by our mechanical industry has been dropping (Figs. 4 and 5). Accordingly it is desirable to analyze the reasons for this state of affairs in relation to the demanding tasks facing our mechanical industry in the next five-year plan, and to make a systematic effort to rectify the situation both in the mechanical engineering ministries and elsewhere. The low level of utilization of plastics is causing considerable national economic losses, particularly in view of the fact that an analysis of selected mechanical applications in Czechoslovakia indicates that for each ton of formed products made of plastics there would be a savings of:

--Kcs 50,000 of production costs,

--1,000 Nh of labor inputs,

--3,000 to 4,000 kWh of energy.

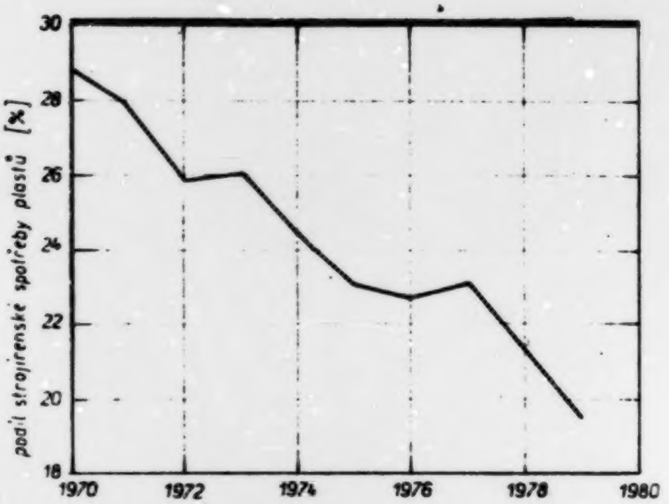


Obr. 4. Trend spotřeby a dovozu plastů v čs. strojírenství (FMHTS, FMVS, FMEP)

Fig. 4. Consumption and import of plastics by the Czechoslovak mechanical industry (FMHTS, FMVS, FMEP).

By failing to appreciate fully the technical and economic advantages of using plastics, we bring about an undesirable increase in the consumption of metals (especially nonferrous metals) in the mechanical industry, as well as uneconomical export of plastics or their primary components for processing.

When we consider the ratio of plastics output to steel output, we find that in 1977, for example, the figure was 4 percent in Czechoslovakia, 17 percent in West Germany and 12.5 percent in France. These examples are indicative of the unfavorable trend in plastics production and utilization. We must consider that the main reasons for this situation are the long-standing basic conception of our national economy based on a high steel output, an inadequate selection of plastics, especially so-called "structural" plastics, the quality of plastics-working machinery, the extent of plastics-working capacities, capabilities for efficient production of molds, our ability to apply modern scientific findings, and the quality of our technical personnel.



Obr. 5. Podíl strojírenské spotřeby plastů na celkové spotřebě plastů v ČSSR

Fig. 5. Percentage of all plastics produced in Czechoslovakia consumed by the mechanical industry.

The purpose of our sketch of the current state of affairs in these areas is to identify problems whose solution could open the way to increased use of plastics.

As regards the selection of plastics which are suitable for mechanical engineering, we may state that as a result of intensive development of new production capacities during the Fifth and Sixth Five-Year Plans, the Czechoslovak chemical industry does provide the main varieties of mass-produced plastics, i.e. polyolefins, polyvinyl chlorides, styrene polymers, polyamides, polymethyl methacrylates, cellulose derivatives, epoxy, polyester and phenolic casting resins, and press-molding materials based on them, although it by no means offers such a selection of these materials for mechanical applications as is currently available from foreign producers. Moreover, a number of plastics currently described as "engineering" types, without which applications in many mechanical industries are unthinkable, are conspicuously lacking. In particular these include polycarbonates, linear polyesters, polyurethanes, fluoride polymers, polyacetals, polysulfines, polyphenylene oxides, polyphenylene sulfides, other types of polyamides, diallyl phthalate and alkyd press-molding materials, thermosetting resins for injection molding, special polyester resins and the like. Obviously there is an extensive variety of modifications of these types abroad, which is opening new possibilities for the use of plastics in a variety of other areas.

This state of affairs is the reason why some applications are impossible because of a lack of materials, or simply because they would require importation of plastics from nonsocialist countries. In this connection we should point out that with the possible exception of fluorine polymers and polyurethanes, thus far there has been only a small degree of commercial exchange of materials among the countries involved in socialist economic integration. Excessive requirements for imports of plastics also result from the low or falling quality of domestically-produced materials. Obviously special types of polymers such as those with high chemical and heat resistance will continue to have to be imported, but our mechanical industries have the potential for using domestically-produced modified materials which would be producible in recently-constructed chemical industry facilities. These include, for example, various filled and reinforced thermoplastics, e.g. polyolefins, polyamides and possibly ABS resins, which would go a long way toward increasing the percentage of plastics used in the automotive industry or the chemical machinery industry, to give two examples. In this connection we can only recommend that our chemical industry take a greater interest in the needs of the mechanical industry and that it show greater flexibility in deciding on production directions which are important for the mechanical industry. This would include, for example, beginning the production of modified polyphenylene oxide and thermoplastic polymers which have been developed in this country. In both cases it would be possible to limit imports not only of these materials, but also of certain other types of structural plastics, from nonsocialist countries.

Inseparable components of the process of increasing the percentage of plastics used by the mechanical industry include research, particularly applications research, and a method of efficiently translating its findings into practice. A number of research institutes and organizations in the mechanical engineering field, general directorates of plastics producers, advanced schools and other institutions in Czechoslovakia have joined together for research in this field.

In recent years special attention has been devoted to new types of Czechoslovak plastics produced by Chemopetrol k.o. For example, data on the physical and mechanical and mechanical properties of Czechoslovak polyolefins and on the changes produced in them by temperature, stress, environment and time have been obtained, proposals for new standards or revisions of existing standards have been developed for the purpose of upgrading specifications and completing lists of materials, methods of evaluating the quality of thermoplastics for injection molding subject to state testing have been worked out, and design guidelines for injection-molding varieties of linear polyethylenes, polypropylenes, PVC's, ABS terpolymers, polyamides and tough polystyrenes have been drafted. To assist the industry, a number of specialized technical and economic papers on plastics and catalogs of components have been produced in order to facilitate decisions on materials and the use of molds and increase the possibilities for cooperation between enterprises.

In spite of this considerable amount of work, in the near future it will not be possible to provide enough of the data required by designers. Designing and dimensioning plastics products currently requires knowledge of a variety of data on the behavior of the materials in complex stress states and under the influence of other factors which cannot be evaluated by simple tests. The question of correlating the results obtained from a test body with the characteristics of a product is still a difficult one, as is the question of what effect the type of working used has on the properties of a piece, semifinished product or finished item. In addition, the development of testing methods for determining engineering properties is far from simple, in view of the current extensive selection of plastics of various consistencies which have been developed for single purposes and are worked using a number of special processes for an extremely varied range of applications. Nor may we overlook the question of the lifetime of a material or product, which makes testing more complicated by necessitating the preparation of toilsome, demanding, expensive programs. In the case of finished products, essential requirements include the introduction and especailly the standardization of test methods, designation of a definitive selection of plastics, and provision of the necessary testing equipment. The complexity of this problem is fully reflected in the setting of standards, where most test methods are used to provide materials specifications for sales purposes and do not yield the data required for design.

Accordingly, the most efficient way of resolving the shortage of design data at present is the creation of materials information systems which accumulate information and classify it in terms of various design considerations. To this end, for example, SVUM [State Research Institute of Materials] has developed a first, simple system of materials information cards on plastics, the INFORM SVUM system, which currently is being used by more than 750 plants and institutes. In keeping with the worldwide tendency in industrially developed countries, in recent years we have been developing a new, more extensive computer-based information system at a higher level of quality, which is expected to begin test operation in 1980. This system is compatible with the System of Standardized Data on Properties (SSSD) which has been developed in CEMA.

But progress in introducing plastics to the mechanical industry is not only dependent on a knowledge of materials properties and the existence of design data; the questions of developing and equipping the industrial base for the working of plastics are especially pressing at present, as are questions of producing molds for plastic forming, which have a critical effect production economy and product quality. The situation is equally complex in these areas.

The main process equipment for the production of plastic parts is machines and molds, which differ with the process used and the nature of the product.

The most widely used production technology in this country is injection molding, which is used with more than 35 percent of all plastics. This is followed by press molding, accounting for about 10 percent, laminate production, at about 5 percent, blow molding at 2.5 percent and vacuum forming at 1.6 percent. No increases in the percentages accounted for by these technologies are planned for the Seventh or Eighth Five-Year Plans, because of a shortage of domestically produced equipment and toolmaking capacities, a dependence on importation of equipment (vacuum forming), a shortage of high-quality domestically-produced thermosetting plastics for injection molding and the like.

With an average 15-year lifetime for a plastics forming machine, 6 to 7 machines a year must be replaced; in injection technology alone, where during the Seventh Five-Year Plan an increase in the number of machines from 2,027 to 2,482 is planned, this would require 1,125 new injection machines, while in casting technology, with a planned increase from 1,678 to 1,814 machines, it would amount to 690 molding presses. This does not provide for resolution of the situation regarding plastics-working machinery. For example, Prago-Union (Plastimat and LNH [Press Plants for New Materials]), the largest plastics working concern, about half of whose products, or 31,000 tons, are cooperative technical items, has injection molding machines whose average age is greater than the length of the modernization cycle, and only 80 percent of the machines are suitable for automation.

The selection of plastics-forming machines currently includes a large number of European and transatlantic state-of-the-art and less advanced models. Accordingly, given the larger quantities of plastics to be worked in the future, we may expect more difficulty in this area as a result of both differences in models and a shortage of foreign exchange for updating the inventory of machines from the nonsocialist countries. This fact further intensifies the need to produce our own machinery or to focus on imports from socialist countries. The situation with regard to the production of plastics-forming machinery and the process of renewing the machine inventory in Czechoslovakia can be judged from the following survey:

--Injection molding machines. The traditional producer, TOS [Machine Tool Factories] Rakovnik, has developed and put into production the CS model series with injection volumes ranging from 30 to 7,000 cm^3, while further efforts to develop machines with modern control and regulating technologies has been suspended; during the Sixth and Seventh Five-Year Plans production has gradually been limited to Vihorlat Snina National Enterprise, which is building a new production facility for the modern CS series with the aim of gradually expanding annual output. However, this enterprise still has insignificant design and development capacities. The development of injection machines for termosetting plastics will also continue at Vihorlat Snina during the Seventh Five-Year Plan. From the CEMA countries, injection machinery from East Germany (Kuasy VEB Trusioma series) and Poland (the Monomat series from Polimex) is available to us.

--Presses for direct press molding and transfer molding of thermosetting plastics. Production by the TOS national enterprise has been suspended, and they are imported from Zywiecka fabryka maszyn [Zywiec Machine Works] in Poland (PHM series).

--Extrusion machinery and blow molding equipment. This is produced with extruder diameters from 30 to 90 mm by Chodos Chodov National Enterprise, which also produces automatic blow molding machines for small hollow bodies.

--Vacuum forming machinery. This machinery is not produced in Czechoslovakia: machines for forming slabs and sheets must be imported from Hungary (Techimpex, VP series).

--Other production technologies (winding and injection molding of glass-polyester laminates, rotary casting, welding, foaming, application of coatings and the like). These account for a smaller volume and most equipment is imported or produced with in-house resources.

The situation as regrads process accessories for the main plastics-forming machines such as tempering equipment, driers, heated hoppers, mills for crushing waste, equipment for machining injected and press-molded pieces, materials conveyors, mixing boxes and equipment for measuring process parameters and the like is also unsatisfactory. The individual enterprises design and produce these accessories with in-house resources, mostly only for their own use, or resort to import.

Another equally important condition for expansion of the use of plastics is the production of molds. Mold production is a constant, long-standing problem for the entire mechanical sector and is delaying the more extensive use of plastics in it. Currently the time elapsing between the design and putting into production of a plastic structural element or part averages 2 to 3 years. One exception is the molds which mechanical engineering enterprises design and produce themselves. The most pressing problem is the production of molds for small and medium-sized series, which are essentially machine industry products. Of the various technologies, injection molds account for the largest volume, followed by press molds and blow molds. Other technologies do not make as great demands for the production of tools, and toolmaking work can be replaced by other production methods, especially forming. While the machinery for individual forming technologies is to a certain extent universal and represents an investment of long-term significance, molds are limited by the specific requirements of the application in question (material, shape, dimensions, tolerances, size of series and the like) and are critical in determining whether technically and economically satisfactory results, i.e. products of the required quality, are obtained in plastics production.

It turns out that about 70 percent of all plastic molds resemble each other in some respect. Accordingly, the idea of using a uniform set of symbols to standardize mold components is nothing new: in the United States, for example, the basic standardized system of molds was created before World War II. Our main plastics-working enterprises are also giving considerable attention to the question: the Plastimat enterprise has developed the RAFO system of modular frames for injection molds, which is being used in about 50 percent (prospectively 80 percent) of the molds produced and accounts for an average of 15 percent of the labor inputs in mold production. A draft design for standardized frames for molds for thermosetting plastics has been developed by the LNH national enterprise in Vrbno near Praded. Unfortunately the production of these universal, standardized parts for mold production is limited to the toolshops of specialized press molding plnats and is not being used extensively so that it can have a nationwide effect.

Functionally the most important part of a mold is the forming cavity (or forming section), which currently is produced in most cases by the classical method, namely machining.

When using new methods of producing the forming parts of molds it is necessary to solve a group of questions expressed by the formula economy-lifetime-precision. Production methods in current use in Czechoslovakia include contour grinding, electroerosion machining, electrochemical machining, galvanoplastic mold production, pressure casting from nonferrous metals (pressing into molten metal), production of shell molds from easily fusible metals by injection (e.g. the MCP system), injection of shell molds made of nonferrous and ferrous alloys (e.g. the TAFA system), pressing into steel and extrusion through a die, casting of nonferrous metals and steel in sand, ceramic or plaster molds, and casting of filled resins, silicone rubbers or combination materials.

These methods have their advantages and disadvantages as regards precision, suitability for large and small injection molding series, and cost as compared with production by machining.

A major shortcoming is the fact that these methods have been introduced in various enterprises solely for in-house use and without coordination, and that there is no specialized tool works to produce plastics molds which would be able to master these technologies and develop them to national significance.

In addition to plastics production, materials research and the condition of the plastics working base, another important factor in the introduction of plastics is the matter of technical development at the enterprise and plant levels. The concept of assigning designs which have been suitably checked and tested in prototype molds to specialized producers presupposes the existence of research, applications and testing centers for plastics in each VHJ. But it has not always been possible to establish such centers and frequently not enough attention has been given to providing those which do exist with materials and manpower. The inadequate activity of these centers is one of the main reasons for the slow introduction of plastics into the mechanical industry to date. We should add, referring specifically to large specialized plastics-working plants, that a number of mechanical engineering enterprises have balked at the production realization stage of specific applications, either because of inadequate capacities or for other reasons.

The continual expansion of scientific and technical knowledge in the polymer field makes it necessary to train specialized technical personnel. The system now in existence, implemented either by social or other institutions through lectures or classes, or by advanced schools through postgraduate courses or research seminars with a limited numbers of participants, is not commensurate with the importance of these data and the needs of mechanical engineering plants. There is a universally-felt shortage of systematic, specialized education in the broader sense, both for lower-level technical personnel and for designers and process engineers with advanced education, which might, as in the case of metallurgists, lead to skillful use of plastics in the plants and a decrease in the risk of failure which currently occasions such mistrust of these materials and is hindering their utilization. Accordingly, if we are to try to comply with the conclusions of the 18th session of the CPCZ Central Committee and the 16th CPCZ congress regarding efficient production in the mechanical industry through increased use of plastics, we must proceed on the basis of actual conditions as regards material resources, production capacities and the equipment base, and the quality of research, standardization, and technical personnel. In a number of cases the situation can be resolved by organizational measures and mobilization of unused potential, but a comprehensive solution is impossible without investments, including import from nonsoicalist countries.

Below we survey the critical factors involved.

In the materials area:

--an expansion of the selection to include materials developed by the Czechoslovak chemical industry which are expected to go into production in the next few years (polyolefins with mineral fillers, basic polyamides, glass-reinforced thermoplastics, modified polyphenylene oxide, polyethylene terephthalate, polyolefin-elastomer mixtures and the like);

--improvement and expansion of the selection of semifinished products (domestically-produced and imported) suitable for prototype and small-series production, with an estimated consumption of about 20,000 tons per year by the mechanical industries;

--acquisition of foreign exchange for essential import from CEMA and nonsocialist countries of engineering plastics whose production is not contemplated in Czechoslovakia and whose replacement by domestically-produced materials is impossible because of their properties (high temperature stability, resistance to chemicals, resistance to low temperatures and the like);

--establishment of price relations for plastics relative to conventional materials in terms of their raw materials inputs, production costs and world supplies of main raw materials.

As regards the industrial base and technologies for plastics working, they include:

--the mobilization of plastics-working enterprises' reserves, e.g. by increasing the shift work coefficient and by increased use of operation of several machines by one worker;

--more intensive, higher-quality cooperation between enterprises in all sectors (product design, mold design and production, automatation and modernization of production facilities and the like);

--modernization of the industrial base for plastics-working and a decrease in the average age of plastics-working machinery by purchase of new machinery and planned development of progressive production equipment;

--intensive development and introduction of progressive plastics-working technologies, particularly injection molding of thermosetting plastics, including development of the necessary machinery;

--the development of special design units for new products, molds and production plant facilities (including the completion of application centers in mechanical plants);

--orientation of long-term modernization efforts toward automatic control of industrial processes and modernization of technology, both by our own research and development facilities and as part of international cooperation (in CEMA), or by deliberate purchase of licenses;

--an increase in the tool works' capacity to produce plastics molds, including supplying them with the needed quantities and selection of metals;

--the development of specialized organizations for production of molds by unconventional methods.

As regards the research and development base:

--in accordance with the worldwide tendency in materials research, a balance should be struck between investment and manpower support of the research and development base for plastics applications on the one hand and materials applications approaches which were traditionally preferred in the past on the other;

--the use of properties which are important for design, dimensioning and production of plastics parts should be evaluated using new scientific findings and modern experimental and computational methods;

--efficient translation of research and development results into practice should be improved by developing materials information systems using computers with a greater ability to accumulate and report operating data on plastic components or structural elements;

--in the area of standardization, when drawing up lists of materials, stress should be laid on the chemical industry's requirements regarding materials specifications relevant to use properties, and more sectorial standardization organizations should be used to unify enterprise setting of production standards;

--applications centers in the individual VJH's should be completed in material and technical terms;

--an effective part should be taken in planning joint experimental programs within CEMA and more use should be made of the results of joint research.

In the training of personnel:

--regularly established, constantly operating organizations should be created to give regular training to technical personnel to the extent prescribed for their proficiency levels;

--the amount of education on polymer materials and their working should be increased in basic trade schools and advanced technical schools.

For the sake of our national economy the important problems described above, whose solution will foster more extensive use of plastics in the mechanical industry, must be evaluated responsibly and skillfully.

8480
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ACADEMY SECRETARY AIRS VIEWS ON RESEARCH GOALS, APPROACHES

Budapest NEPSZABADSAG in Hungarian 16 Aug 81 p 5

[Interview with academician Lenard Pal, chief secretary of the Hungarian Academy of Sciences, by Denes Kovacs: "Science and Society." Place and date not given.]

> [Text] The changes in world economy that took place in the 1970s, not to speak of deteriorating international relations, created more difficult conditions for our country's economic and social development. The new conditions present higher requirements for our scientific research as well. Related problems and tasks were discussed with academician Lenard Pal, chief secretary of the Hungarian Academy of Sciences.

[Question] It came up frequently at the Academy's general meeting of this year how scientific research can adapt to the changed situation. What are the tasks that researchers and science management organs face?

[Answer] International and domestic social and economic movements and changes will affect our scientific activity in the 1980s even more than before. The already existing requirements for society, and those coming in the future, may be met only if scientific research also adapts to them and takes part in the creation of conditions necessary for meeting these requirements. And this means, even in the area of science, improved output and quality, more spirit of creativity and enterprise, and higher standards and culture. This development can unfold not as a result of spontaneous forces but that of careful and conscious action.

Today's politics create favorable conditions for creative initiative in all areas, including science. And the existing achievements of building society serve as an adequate basis for the next steps and for accepting and solving tolerable conflicts. There is a need for this, for this is the only way in which the favorable tendencies in the socio-economic processes can strengthen. In order for the socio-economic processes to have more effect on science, and vice-versa, we must continually modernize society's system of planning, regulation, decision making, management, training, institutions and organizations, and the sphere of interests and values that affect social action. This modernization will help not only improve the mutual effects of science and the socio-economic processes but will also help us adapt more efficiently to society's and the economy's real laws of movement.

[Question] There is a danger today that, as a result of every-day pressures, a perspective and long-range planning is pushed into the background in society and the economy, and perhaps most of all in science. In science, this may result in a neglect of basic research. How significant is basic research at present?

[Answer] In recent years' research planning and research management, research that was directly connected primarily to economic goals, and technical development were emphasized more, understandably and rightly so. This may have resulted in some scientists' belief that, on the one hand, basic research and long-range developments are less important now than before and, on the other hand, that basic research is more or less limited and pushed into the background. The task now is to adapt the types of research more to our country's resources, economic possibilities and needs. No matter how much attention is paid to the present short-range tasks, we cannot allow research that is supposed to, and can, influence the future, to lose its real significance. Our economists frequently say that even short-range decisions and measures have long-range consequences, and this statement can perhaps even be reversed: the short-range and momentary effects of long-range measures cannot be neglected either.

When, among rapid changes, we put great emphasis on the importance of various concrete and short-range research that promise direct practical results, it would be a mistake to forget that in order to carry out these tasks, we need new ideas and a background of high-quality basic research that points toward the future. The essence of basic research is to discover the unknown, to discover new phenomena and laws. It is evident that research that is directed toward the discovery and understanding of still unknown laws is different from research directed toward concrete economic goals. For discovery and the exploration of the unknown law cannot be planned ahead. Only programmable, applied and developing research can be carried out within a prescribed time period and the limits of a given fund. In spite of this, however, the selection of goals for basic research cannot be accidental.

Scientific prognoses have a great significance in determining the directions of basic research. The Hungarian Academy of Sciences has just recently finished the work of sketching up for the coming decades the expected main tendencies of scientific development. No one should think, however, that the processes that will actually take place and the processes described on the basis of our present knowledge will be identical. Our ideas about the future are tentative in all areas, including science, and the longer time span they encompass, the less reliable they are. This also makes it necessary to continually change our prognoses and ideas about the future on the basis of extensive studies of the changes that take place in the meantime.

[Question] A continually recurring problem in scientific research (including basic research) is the evaluation of results. How can one realistically determine the actual "worth" of a basic research finding?

[Answer] It is difficult and can be done only from a perspective of time. Valuable results are those which, even if they cannot affect the "weather," can affect at least the "wind" in the given area of science. However, this can be proven in many cases only on the basis of the evaluation of the international scientific public. The starting point may be the evaluation of international scientific life. If many publications are greeted with silence, that is not very good. Results of basic research are published in scientific journals which are indispensable sources of research information. It is a matter of life and death for scientists to learn about the findings of others and to publish their own findings. He who does not do this, ceases to be a scientist. It is evident that the rules of the game are different in economic and military research, but it has been proven that significant technical advancements or outstanding works yielding significant results in economy and profits (these cannot be published) are always accompanied by "purely" scientific publications on the same subjects, for no high-standard institution engaged in economic or technical research can do without a high-level scientific background.

One reason why I must emphasize this is that opinions related to scientific publications are polarized around two extreme evaluations. According to one of them, the evaluation of scientific results cannot be based at all on publications, for many sham results are published, there is a possibility for self-advertisement and, most of all, really valuable results must be put to use, not published. According to the other extreme view, only results known and accepted by the international scientific world may be considered as scientific. Both views have a rational basis, and I must only add that, according to the nature of the research (i.e., whether it is basic research or applied research with direct practical goals), one or the other approach must play a bigger (but not exclusive) role in the evaluation.

[Question] Basic research is generally not inexpensive. This is especially true in our country: our financial resources are limited, we cannot do research on everything. How can our research goals be made more rational and conscious and how can they be better determined?

[Answer] First, basic research is generally less expensive than applied and developmental research. In spite of this, more attention must be given for selection. It is imperative to support outstanding work and talent and to reject mediocrity producing sham results. How? Among other things, we must put more emphasis on competitive financial support.

The evaluation of applicants is not a small problem. Who should the judges be? For qualified people are mostly interested parties themselves--we are a small country. This problem may be alleviated by more democracy and publicity; this way, there is a possibility for an extensive comparison and a more thorough evaluation. Although I myself consider publicity a very important aspect of the evaluation, I feel nevertheless that not even publicity guarantees a completely fair selection. For we know many examples from the history of science that the majority, clinging to conventions, considered significant research concepts as senseless, and that these new and significant discoveries were made after all, was due to the will power--or self confidence, if you like--of a few determined and convinced researchers.

I think that in the area of basic research, talented and successful researchers and research collectives must, within reason, be given the opportunity to determine their own research objectives. It is the task of research management to evaluate, with the help of scientific public opinion, whether the necessary and appropriate conditions for continued "free opportunity" still exist.

I would like to mention here that in addition to basic research, a significant economy-oriented research is going on at the Academy. The real value of this research is determined not by the number of scientific publications but by economic results that were achieved. We must also see, however, that economic profit is the result of the mutual effects of many factors that can be controlled (and probably of many others which are hard to control). For this reason, economically oriented research can be evaluated only on the basis of a complex analysis of related economic activities.

[Question] Under the present circumstances, it is especially timely to re-evaluate and, if necessary, modify the long-range national research plans accepted 10 years ago. What are the main experiences gained in the course of planning and what should be the course for the further development and modernization of planning?

[Answer] I think it is very important to overview the main directions of long-range scientific research carefully and in close harmony with long-range national economic planning. Long-range research plans were made in the early 1970s in the National Long-Range Scientific Research Plan, and played a significant role in the better planning of our research; they were very helpful in bringing scientific research closer to social, economic and cultural goals. Later, however, some of the main objectives became rigid, and planning was slow in reacting to the emerging new problems. The selection of new tasks was slow and there was hardly a single instance where obsolete or less up-to-date tasks were discontinued. For this reason, our past experience must be carefully weighed, and the long-range scientific research plan must be updated. We are striving for really making this plan a continually updated system of research trends that are most important from the aspect of the society's long-range development, in a way to make it serve the solution of basic problems arising from the internal development of science on the one hand, and to make it help giving a scientific foundation for the long-range social and economic plans on the other hand. From this aspect, the new (or modified) plan may actually become an extensive conception of research policy which will include the main trends which will include, on the one hand, the foundation for economically oriented middle-range research programs and, on the other hand, the intensive domestic development of the sciences and the most important research objectives that will open up new "fields of action."

I mention it as an example that biology must be especially emphasized in working out the long-range scientific research plan, for biology, connected with other fields of science (physics, chemistry, electronics etc.), will no doubt become one of the next century's most important sciences. Namely, the development of biology makes it possible for us to influence the living world and to change the living conditions. Under our domestic conditions, the application of biotechnical methods has a great significance, for we must strive more and more for using our bio-genetic and biotechnical resources in the increase of our crop and animal production and, most of all, in the increase of efficiency. The intensive development of the biological sciences also serves our long-range economic goals. We must emphasize, however, that the biological sciences cannot do without research in physics, chemistry, mathematics, computer technology, electronics etc., and thus there is a need for working out a complex development program.

[Question] The development of scientific research is closely and mutually connected with innovative activity. How do you actually define innovation? How can we make progress in this vital area?

[Answer] In a more limited sense, innovation is defined as a qualitative development of products, production and technology, resulting in innovations that yield economic profit. This qualitative development takes place simultaneously in research, development, production and consumption and thus innovation emerges as a binding process which mediates between mutual effects; the effects of this process can be felt in all links of the research-development-production-marketing chain.

However, innovation actually includes not only economically oriented technical innovation but also social innovation in a broader sense. The level of social innovative capacity has a great effect on the success of economically oriented innovations.

The efficient satisfaction of social needs is the driving force of innovation. But the producing or marketing organization will have "its own interest" in innovation only if its economic stability is endangered more by a lag behind the leaders than by the risks connected with the implementation of innovations. Thus the element in which this process takes place has a determining role in making the innovative process easier or more difficult. And since innovation may become the source of conflicts, the change of structure will slow down and the obsolete (inefficient) activity will be stabilized if society has little capacity for tolerating conflicts or if the producing-marketing organization has more interest in eliminating the conflicts than in implementing the innovation.

All of these phenomena call our attention to the fact that the unfolding of technical-economic development is based on many conditions which are not of technical-economic nature. We must thus pay close attention to the social and organizational factors of innovation, for this is the only way in which we can help society to use the results of scientific and technical progress, and this is the only way in which scientific and technical progress can be united with the virtues of socialism.

9414
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POSSIBILITIES OF THE OPTIMIZATION OF PATTERN IMAGING FOR THE PREPARATION OF LSI MASKS

Budapest HIRADASTECHNIKA in Hungarian Vol 32 No 6, 1981 pp 205-211 manuscript received 18 Jul 80

BEKE, Istvan, graduate electrical engineer, staff scientist; and BERECZKEI, Ferenc, graduate electrical engineer, staff scientist, Research Institute for the Communications-Engineering Industry.

[Abstract] The optimization described minimizes the total time required for pattern generation and stepping for each mask layer; ensures that the imaging time of the patterns for a board is shorter in both pattern generation and stepping then the expected time between two malfunctions; minimizes board consumption; and ensures that all devices have identical loadability. In generating the pattern, the ultimate goal was to use as few exposures as possible within the shortest possible time. An analytical study was carried out to characterize groupwise pattern imaging and minimization of the tracking route length. Graph theory and a novel theory for seeking the shortest Hamiltonian path were employed. Since the path length depends on the location of the starting point, an evaluation was made on the relationships between starting-point location and path length: It was found that the starting point should be the geometric centerpoint of the imaging field. A compromise must be made between minimizing path length and generation time. Figures 3, references 3: 2 Hungarian and 1 Russian.

2542
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EVALUATION OF DIGITAL PRINTED CIRCUIT BOARDS IN THE TESTOMAT-C AUTOMATIC TESTER

Budapest HIRADASTECHNIKA in Hungarian Vol 32 No 6, 1981 pp 227-231

NAGY, Sandor Zoltan, electrical engineer, and FRIGYES, Ivan, electrical engineer, BHG [Beloiannisz Communications-Engineering Factory]

[Abstract] The Testomat-C automatic tester (carrying out GO-NOGO evaluations in the off-line mode) was developed at SZTAKI [Computer-Technology and Automation Research Institute]. On the basis of a control program it determines whether the board is OK or faulty. If it is faulty, the failure is localized manually. The test programs are generated with a CDC 3300 computer; testing is controlled by a small computer; the test sequence consists of data entry, testing (establishment of the input conditions and measurement of the output parameters), and determination of the next cycle. Tests are carried out cyclically. The use of the instrument for the evaluation of NYAK printed circuit boards used in telephonic equipment was described. Logic circuits, RAM memories, visual displays, and non-TTL level digital circuits are tested. Foil breaks, soldering faults, insertion faults, component faults, and other faults are identified. Fault localization speed depends on the complexity of the circuit, the effectiveness of the test program, and the competence of the tester. The instrument is capable of being further developed to permit its use to match the requirements of specific printed circuit boards better. Figures 5, no references.

2542
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PATTERN GENERATOR FOR TESTING MICROPROCESSORS

Budapest MERES ES AUTOMATIKA in Hungarian Vol 29 No 7, 1981 pp 258-263
manuscript received 9 Jan 81

BARTOS, Imre, and SZAMOSKOZI, Zoltan, Research Institute of the Communications-Engineering Industry, Budapest

[Abstract] The realization of testing microprocessors (such as the Intel 8080A and the Zilog Z80, widely used in Hungary) with the aid of a pattern generator operating on the basis of the stored-pattern principle was discussed and illustrated with an example. The patterns are stored in RAM memories since in this manner loops, branchings, and concentration can be best accomplished; programs can be more easily written; and the memories can be built more cheaply than in case of shift memories. An analysis of the operation of the 8080A and Z80 microprocessors indicated that a local memory made up of individually addressable segments with RAM circuits meets all requirements. The read cycle time of the RAM circuits determines the speed of the pattern generator. Output multiplexing permits the speed to be increased. In the actual testing, all registers of the microprocessor are filled with data, the registers are read out and checked for writeability and mutual distortion, all possible data are written into Register A, and a check is made to see whether there is a change in the contents of the other registers and Register A. Figures 4, references 17: 6 Hungarian, 1 Russian and 10 Western.

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END

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East Europe Report

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EAST EUROPE REPORT

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[III - EE - 65]

MICROPROCESSOR CONTROL PC 1520 M FOR INDUSTRIAL ROBOTS

Description of Control System

East Berlin RADIO FERNSEHEN ELEKTRONIK in German Vol 30 No 7, Jul 81 pp 424-426

[Article by Hans Georg Wanke, engineer, VEB Automobile Construction Scientific-Technical Center: "Microprocessor Control PC 1520 M for Industrial Robots"]

[Text] Presently there are no low-priced solutions in contemporary control technology available for small-scale control tasks in the manufacture of rationalization devices. This article describes an application for the microcomputer system K 1520 for controlling simple industrial robots and special machines. Two connection controls for digital process input and output are presented.

With the creation of a central unit for the planning, design and manufacture of rationalization systems for the Industrial Association for Motor Vehicle Construction in the automobile construction scientific-technical center in Karl-Marx Stadt arose the necessity of developing a special control technology. Work is presently being done on the development, testing and preparation for manufacture of a microprocessor control for simple industrial robots and special machines. This control with the designation PC 1520 M is an application of the microcomputer system K 1520 of the VEB Kombinat Robotron, which is made up of the input and output components multiplex input control (MES), input and output control (EAS) and PMS [expansion unknown], as well as display and operating keys.

Control Assembly

Card components with the dimensions 215 mm by 170 mm have been accommodated into the container system of the microcomputer K 1520, and are linked together through a printed reverse wiring. The plug coupling on the knob side of the card components MES, EAS and PMS serves the connection on the process side. The modular control assembly permits the use of the MES card component, with a maximum of eight EAS, two to three PMS and additional components of the K 1520 system (for example, connection controls and memory enlargement).

Power supply modules from the VEB Robotron provide the required working voltages of 5V, 12V and -5V. These modules are accommodated in a separate power supply cassette.

Figure 1 shows the configuration for the control pattern of loading robot.

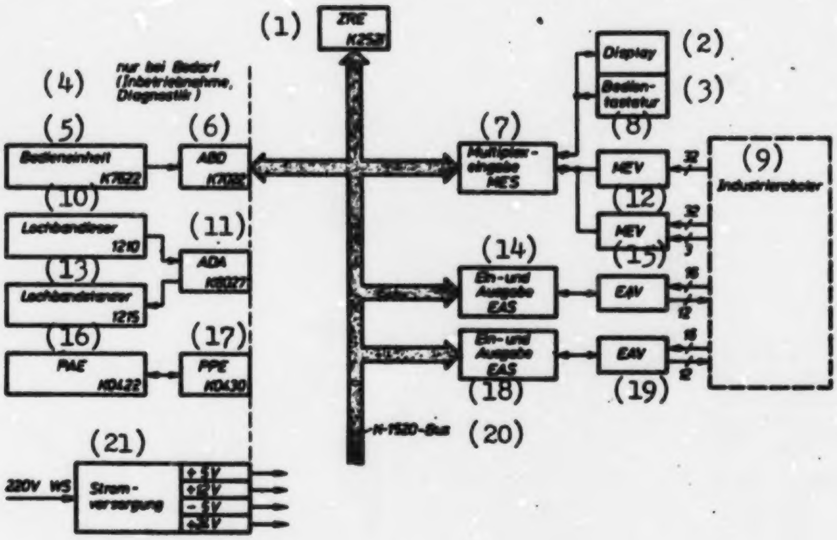
(1)
ZRE
K2521
(2)
Display
(3)
Bedien-
tastatur
(4)
nur bei Bedarf
(Inbetriebnahme,
Diagnostik)
(5)
Bedieneinheit
K7622
(6)
ABD
K7052
(7)
Multiplex-
eingabe
MES
(8)
MEV
(9)
Industrieroboter
32
(10)
Lochbandleser
1210
(11)
ADA
K8027
(12)
MEV
32
3
(13)
Lochbandstanzer
1215
(14)
Ein- und
Ausgabe
EAS
(15)
EAV
16
12
(16)
PAE
K0422
(17)
PPE
K0430
(18)
Ein- und
Ausgabe
EAS
(19)
EAV
16
12
(20)
K-1520-Bus
(21)
220V WS
Strom-
versorgung
+5V
+12V
-5V
+5V

Figure 1. Component View PC 1520 M

Key:

1. Central arithmetic unit
2. Display
3. Operating keys
4. Only when needed (starting, diagnostics)
5. Operating unit
6. Connection control ABD [operator console]
7. Multiplex input
8. Multiplex input distributor
9. Industrial robot
10. Punched Tape Reader
11. Connection control ADA [SIF 1000 units]
12. Multiplex input distributor
13. Perforated tape puncher
14. Input and output
15. Input and output distributor
16. Program Supplement PAE [EPROM recorder]
17. Program Supplement PPE [EPROM Programming Device]
18. Input and output
19. Input and output distributor
20. K 1520 bus
21. Power supply

Central Calculating Unit (Robotron K 2521)

This card component is a single-board calculator with the functional groups

--Microprocessor U 880
--Memory: 1K bit RAM U 202
3K bit EPROM U 555
—Parallel interface with U 855
—Meter, timer with U 857

—Cadence generator for the system cadence of 2.5 megahertz
—Initial erasing
--Bus propeller for the system bus K 1520

Multiplex Input Control MES

The card component MES (Figure 2) employs parallel interface and meter of the card component central arithmetic unit over the coupling bus. It is of central importance within the control PC 1520 M and includes the functions

--Display connection
seven-segment LED's with a maximum of ten positions or single LED's for providing readings in the multiplex operation (software controlled)
--Multiplex input
32 bits (8X4 bits), optimum coupling, 24V, 15mA direct current, 32 bits (8X4 bits), TTL level [Transistor-Transistor Logic]
--Interrupt input
3 bits, optimum coupling, 24V, 15mA direct current
--Memory enlargement
1K bits RAM U 202
3 plug sockets for a maximum of 3K bits-EPROM U 255
--Cycle monitoring
--Monitoring of working voltage
--Diagnostics reading and operating keys

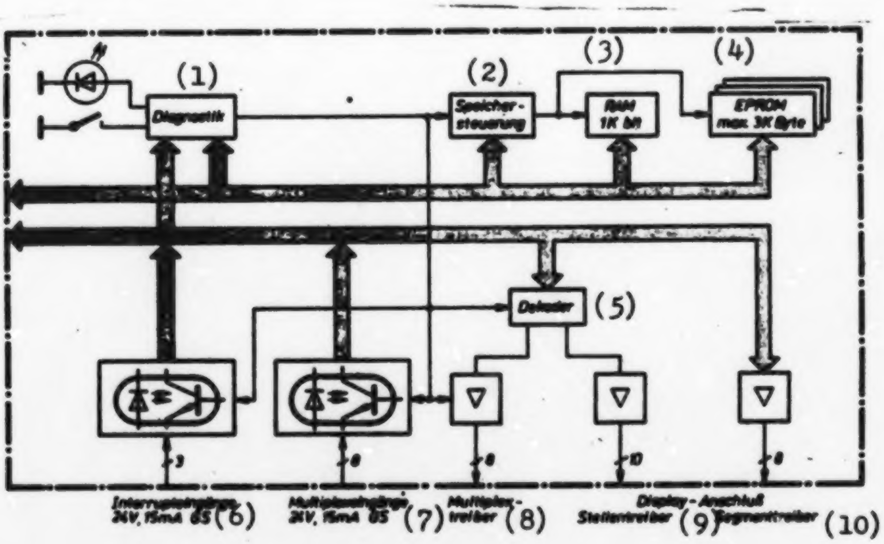
(1)
Diagnostik
(2)
Speicher-steuerung
(3)
RAM 1K bit
(4)
EPROM max. 3K Byte
(5)
Dekoder
3
8
8
10
8
Interrupteingänge 24V, 15mA GS (6)
Multiplexeingänge 24V, 15mA GS (7)
Multiplex-treiber (8)
Display-Anschluß
Stellentreiber (9)
Segmenttreiber (10)

Figure 2. Basic Circuit Diagram for Multiplex Input Control MES

[Key on following page]

Key:

1. Diagnostics
2. Memory control
3. RAM 1K bits
4. EPROM
   Maximum 3K bits
5. Decoder
6. Interrupt input
   24V, 15 mA direct current
7. Multiplex input
   24V, 15 mA direct current
8. Multiplex propeller
9. Display connection position propeller
10. Display connection segment propeller

Input and Output Control EAS

The output relays are activated and the input with optimum coupling is operated over the parallel interface U 855. The process-side connection over a 58-pole plug coupling which serves the connection for the input-output distributor, effects the output for 12 bits, 24V, 2 A direct current, and the input for 16 bits, 24V, 15 mA direct current. The logical states of the input and output are indicated on the front side by LED's. Figure 3 shows the basic circuit diagram of the card component EAS.

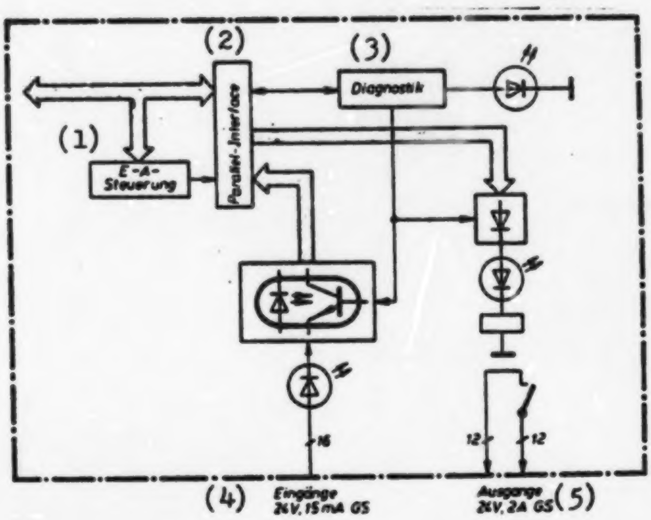

Figure 3. Basic Circuit Diagram for the Input and Output Control EAS

Key:

1. Input and output control
2. Parallel interface
3. Diagnostics
4. Input
   24V, 15 mA direct current
5. Output
   24V, 2A direct current

Distribution Frame

The distribution conductor plates provide for the direct connection of the site members (for example: magnet valves, contactors), terminal switches, initiators, etc., over flat plug couplings. The conductor plates have a format of 415 mm by 130 mm, and can be set over spacer bolts. The distributor can be mounted either in the control container, or preferably, in the immediate proximity of the machine.

Additional Components

The display and operating keys, which are joined to the computer bus over the card component MES, provide for performing the operating functions. The card component positioning and measuring control MES serves to control two hydraulically or pneumatically driven axles.

The K 1520-bus is available for purposes of beginning operation and testing. As was shown in Figure 1, the following can be selectively plugged in:

--Operating unit (Robotron K 7622) with connection control ABD (Robotron K 7028)
--Perforated tape reader 1210, perforated tape puncher 1215 with connection control ADA (Robotron K 6022)
--Program supplement PPE/PAE (Robotron K 0420/0422) for programming EPROM's

Function

Software

The programmable control PC 1520 M is mainly used to solve nonnumerical control tasks. The control problem, which is taken down in the form of logical associations (Boolean equations) and stored on EPROM's, is processed through the microcomputer with an interpretation program. Here the Boolean equations represent the calculating specifications, whereas the logical variables to be processed are input, output, auxiliary storage, etc.

The interpretation program works cyclically, and computes the output variables equation for equation dependent upon the input variables. Special functions, such as multiple-axle positioning procedures, where time is critical, are programmed directly into the assembler language of the microcomputer.

The operating system of the microcomputer organizes the cyclical flow, input and output operations, interrupt processing and the completion of background programs.

Programming

The programming of Boolean equations and the storage on EPROM's can occur externally with the help of formative systems or economic calculating units and other PROM programming equipment, or (preferably) at the time of control operations. In the latter case the equations are input at the job site using the operating keys and shown on the display.

In the case of program changes an EPROM is reprogrammed with the program supplement and exchanged with the old.

It is advisable in the case of extensive start-up work and testing to use RAM's (for example, card component OPS [Main Memory 4 K-byte RAM] K 3520 or OPS K 3521) instead of EPROM's.

Diagnostics

A series of diagnostic measures is foreseen for the PC 1520 M in order to further increase the reliability and to lower the costs of error search. For the present they are limited to internal diagnosis, that is, diagnosis of functional control elements. A later extention of diagnostics to include the special machinery or industrial robot is possible. A first step in this direction is an error indication on the display, to be programmed through Boolean equations.

Internal diagnostics deals with components and elements in four different stages:

1. Basic diagnostics, after establishing the working voltage

2. On-line diagnostics, cyclical monitoring, voltage monitoring, LED readings for input and output

3. Off-line diagnostics, activation through operations

4. Diagnostics by external means.

The first three diagnostic stages are realized with a minimum of outlay for hardware through programs which are constantly at hand. More extensive tests (for example, full control examination) require external storage.

Configuration of K 1520 Described

East Berlin NTB--JOURNAL OF INFORMATION PROCESSING in English Vol 24 No 6, Nov-Dec 80 pp 177-179

[Article by B. Bader, engineer, Zella-Mehlis: "Remarks on the Configuration of Microcomputers Robotron K 1520"]

[Text]

1. Modular Concept

The microcomputer system robotron K 1520 is composed of the microcomputer K 1520 and the microcomputer software K 1520. The following article is concerned with the set-up of the hardware of the microcomputer K 1520.

The logic-functional units of the microcomputer K 1520 are accommodated on separate plug-in units, and they are connected by the system bus. Plug-in inserts are used to accommodate the plug-in units. The individual components can be assembled into microcomputers of any configuration to match the application in hand. The advantageous set-up of the central arithmetic unit means that one plug-in unit is already sufficient where capacity demands are low. The system bus is not required for such a configuration.

The plug-in units are equipped with direct or indirect plug-in bus connectors.

2. Return Wiring and Plug-in Inserts

The plug-in units are taken up by the plug-in inserts. Both sets of entire plug-in units as well as individual units can be combined in any manner desired and housed in enclosures of the user, e.g. in EGS assembler inserts of 480 mm width.

The plug-in connector terminals of the return wiring of the coupling bus, and also of the system bus, are provided with long wire-wrap pins. This means that any connectors on the return wiring circuit boards can be additionally wire-wrapped.

For the system bus (lower return wiring circuit board with the plug connectors X_1) there is usually no need for extra wrapping because all signal connections are interlinked by printed conductors. The coupling bus, on the other hand, has printed conductors only for the ground and power supply terminals. All other connections have to be wound. Thus, the coupling bus is suited for the connections of the terminals of the user's own plug-in units. In the event that the user's own enclosures are employed, the user himself will have to complete the return wiring. The return wiring of the plug-in inserts can also be integrated in these enclosures. Two plug-in inserts can be screwed together. The bus lines can be conducted on the return-wiring side by wrap connections between the neighbouring edge plug connectors. In this manner insert enclosures can be produced to accommodate 16, 22, a.s.o. plug-in units. The return wiring of the system bus can be extended up to a length of 800 mm.

3. Priority Allocation

In principle, every plug-in unit can be plugged into any point in the plug-in insert. In practice, however, it is the distance with which the plug-in unit with its peripheral circuitry (connection control, bus amplifier, etc.) is plugged from the central arithmetic unit that determines the priorities of the plug-in concerned in the treatment of interrupt requests and in the presence of requests for bus control. The smaller the distance to the central arithmetic unit, the higher the order of priority. Plug-in units for storage are not considered in this context. Storage places that are not occupied are either provided with bridges (IEI – IEO and BAI – BAO) in the return wiring, or the plug-in units are all placed in a flush arrangement.

4. Bus Extensions

By interposing a bus amplifier the system bus can be extended load-wise by a maximum of 2.5 m. The line K 0521 (2 pieces) is used as extenison cable. The adapter plug-in unit K 0522 is required for the connection of a new plug-in insert.

Provided that certain conditions are observed, a star-shaped or serial system can be set up with several plug-in inserts. The star-shaped system contains several bus amplifiers in one plug-in insert. The serial system allocates a bus amplifier to each plug-in insert.

5. Semi-conductor Store

A 64K-byte store can be addressed with the address bus. Storage can consist of working stores, combined working and read-only

Table 1. System components of the microcomputer robatron K 1520
Code K XXXX.XO means indirect bus plug connector
Code K XXXX.X5 means direct bus plug connector

Designation	Abbrev.	Cipher	No of plug-in units	Remarks
Central processing unit	ZRE	K 2521.00	1	Clock generator, real-time clock, 1K-byte RAM, 3K-byte EPROM, parallel input and output
Central processing unit	ZRE	K 2521.05	1	
Central processing unit	ZRE	K 2522.00	1	Real-time clock, 1K-byte RAM, 3K-byte EPROM, parallel input and output
Central processing unit	ZRE	K 2522.05	1	
Central processing unit	ZRE	K 2523.00	1	Clock generator, 1K-byte RAM, 3K-byte EPROM, parallel input and output
Central processing unit	ZRE	K 2523.05	1	
Central processing unit	ZRE	K 2524.00	1	1K-byte RAM, 3K-byte EPROM, parallel input and output
Central processing unit	ZRE	K 2524.05	1	
Central processing unit	ZRE	K 2525.00	1	Clock generator, real-time clock, 8K-byte EPROM
Central processing unit	ZRE	K 2525.05	1	
Main memory 4K-byte RAM	OPS	K 3520.00	1	n-MOS
Main memory 4K-byte RAM	OPS	K 3520.05	1	n-MOS
Main memory 4K-byte RAM	OPS	K 3521.00	1	CMOS
Main memory 4K-byte RAM	OPS	K 3521.05	1	CMOS
Main memory 16K-byte RAM	OPS	K 3525.00	1	dynamic RAM
Main memory 16K-byte RAM	OPS	K 3525.05	1	dynamic RAM
Main ROM 6K-byte EPROM, 2K-byte RAM	OFS	K 3620.00	1	n-MOS RAM
Main ROM 6K-byte EPROM, 2K-byte RAM	OFS	K 3620.05	1	n-MOS RAM
Main ROM 6K-byte EPROM, 2K-byte RAM	OFS	K 3621.00	1	CMOS RAM
Main ROM 6K-byte EPROM, 2K-byte RAM	OFS	K 3621.05	1	CMOS RAM
ROM 16K-byte EPROM	PFS	K 3820.00	1	
ROM 16K-byte EPROM	PFS	K 3820.05	1	
Bus amplifier	BVE	K 4120.00	1	
Bus amplifier	BVE	K 4120.05	1	

Connector control floppy disk storage	AFS	K 3121.00	1	1 to 4 floppy disk units MF 3200
Connector control floppy disk storage	AFS	K 3121.05	1	
Connector control SIF 1000 units	ADA	K 6022.00	1	robotron 1210, 1215, 1156 and 4000 (console printer)
Connector control SIF 1000 units	ADA	K 6022.05	1	
Connector control video display screen	ABS	K 7023.00	1	Video display assembly K 7221 (2 brightness stages)
Connector control video display screen	ABS	K 7023.05	1	
Connector control punched tape station	ALB	K 6025.00	1	Punched tape station K 6200
Connector control punched tape station	ALB	K 6025.05	1	
Connector control cassette tape unit	AKB	K 5070.00	1	1 or 2 cassette tape units K 3200 of 1 cassette tape unit K 3221
Connector control cassette tape unit	AKB	K 5070.05	1	
Connector control operator console	ABD	K 7022.00	1	Operator console K 7622
Connector control operator console	ABD	K 7022.05	1	
Connector control V.24 interface	ASV	K 8021.00	1	2 channels V.24
Connector control V.24 interface	ASV	K 8021.05	1	
Operator console	BDE	K 7622.00		Without housing for building in
Operator console	BDE	K 7622.01		With housing as table-top unit
EPROM programming device	PPE	K 0420.00	1	Connection of EPROM recorder for EPROM programming
EPROM programming device	PPE	K 0420.05	1	
EPROM recorder	PAE	K 0422		Table-top unit
EPROM erasing unit	PLG	K 0421		Table-top unit
Plug-in units insert	STS	K 0120		5 plug-in places
Plug-in units insert	STS	K 0121		11 plug-in places
Connecting lead	LTG	K 0321.01		For bus amplifier: 2.5 m: 2 leads
Connecting lead	LTG	K 0321.02		For bus amplifier: 1.2 m: 2 leads
Connecting lead	LTG	K 0321.03		For bus amplifier: 0.6 m: 2 leads
Connecting lead adapter	VLA	K 0322.00	1	For connecting lead
Connecting lead adapter	VLA	K 0322.05	1	

Table 2. Power requirements of the plug-in units in mA

Ab-brev.	Cipher	5P	5N	5PG	12P	12NR
ZRE	K 2521.00 05	1500	70	240 (150)	120	—
ZRE	K 2522.00 05	1450	70	240 (150)	120	—
ZRE	K 2523.00 05	1450	70	240 (150)	120	—
ZRE	K 2524.00 05	1400	70	240 (150)	120	—
ZRE	K 2525.00 05	1000	200	—	300	—
OPS	K 3520.00/05	600	—	1100 (600)	—	—
OPS	K 3521.00/05	600	—	40	—	10
OPS	K 3525.00 05	600	0.03	—	550	—
OFS	K 3620.00 05	700	200	500 (300)	300	—
OFS	K 3621.00 05	700	200	40	300	10
PFS	K 3820.00/05	900	500	—	900	—
BVE	K 4120.00 05	750	—	—	—	—
AFS	K 5121.00 05	2500	20	—	—	—
ADA	K 6022.00 05	900	—	—	100	—
ABS	K 7023.00 01	2800	100	—	150	—
ALB	K 6025.00 05	1000	—	—	—	—
AKB	K 5020.00 05	1600	—	—	—	—
ABD	K 7022.00/05	1200	—	—	—	—
ASV	K 8021.00 05	800	—	—	60	140
PPE	K 0420.00 05	1100	50	—	200	—

stores, and of read-only stores. The number of address bits can be extended by user-specific control of the signals /MEMDI 1 and /MEMDI 2 of the coupling bus. A storage volume of 128K-bytes can be addressed.

6. Connections for Input and Output

The bits AB0 ... AB7 of the address bus apply with /IORQ as device address for input and output. This means that 256 addresses can be implemented for input and output.

The address areas 00 ... $7F_H$ and 90 ... FF_H are available for device controllers. The in-between address area is allocated to the peripheral circuits of the central arithmetic unit.

7. Multi-computer Combinations

Several computer configurations of the type K 1520 are coupled by specific connections of the coupling bus (generated by the parallel input/output circuit of the central arithmetic units K 2521 ... K 2524). The connecting length must not exceed 480 mm, otherwise extra measures become necessary, e.g. interposing of amplifiers.

Up to four computer configurations can be combined. Each configuration can consist of a complete microcomputer K 1520 with storage, connection controls, etc.

8. Power Supply

The power supply modules of the microcomputer system K 1510 can be employed for the power supply of the microcomputer K 1520. Remarks on the configuration are given in the tables 2 and 3 [3].

The voltages 5P and 5PG can be fed from a common source. The 5PG voltage is the supply voltage for the RAM storage circuits. To ensure that the stored data is not lost in the event of a mains failure, 5PG must be larger than 2V. Small accumulators on the plug-in unit retain the data with CMOS-RAM.

5 P = + 5 V ± 5 %
5 N = − 5 V ± 5 %
5 PG = + 5 V ± 5 %
12 P = + 12 V ± 5 %
12 NR = 26 V ± 12 %; − 20 %

The power requirements, specified next to the power requirement values of 5 PG in brackets, applied to the idling current > 2 V.

9. Cables and Connection Lines

The microcomputer K 1520 has no cables of its own for the connection of peripheral units. The corresponding cables from the assortment of the microcomputer system K 1510 can be used for this purpose [3]. *NTB 2738*

References

[1] Betriebsdokumentation Mikrorechner K 1520
1.11.004 650.0/97

B. Bader: Mikrorechnersystem K 1520. radio · fernsehen · elektronik 28 (1979), No 10, pp. 616 to 620.

[3] R. Günther: Remarks on the Configuration of Microcomputers K 1510. NTB 24 (1980), No 1, pp. 24 to 27.

Table 3. Power requirements of the units

Designation	Cipher	u (V)	f (Hz)	I (A)
Operator console	K 7622	220 + 10 %; − 15 %	50 ± 2	0.13
EPROM erasing unit	K 0421	220 + 10 %; − 15 %	50 ± 2	0.12

CSO: 2302/7

DETERMINATION OF SERUM ALKALINE PHOSPHATASE, CA AND INORGANIC P VALUES IN THE BLOOD SAMPLES OF PHEASANT EMBRYOS TREATED WITH WOFATOX 50 EC, METHYLPARATHION 18 WP AND CAPTAN

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 36 No 6, Jun 81 pp 426-428
manuscript received 24 Nov 80

[Abstract] In Hungary, thiophosphoric acid derivatives with methylparathion as active ingredient are currently used as insecticides while earlier, the use of ethylparathion was also permitted. Teratological studies were conducted using two compounds of different composition and concentration but both containing methylparathion: Wofatox 50 EC and methylparathion 18 WP. The phtlalimide-type Captan techn. 92 percent was used as positive control. The SAP, Ca and inorganic P values were determined and were compared with earlier data using ethylparathion insecticides. On the 12th day of incubation, a 0.1 ml aqueous suspension or emulsion containing different concentrations of the test chemicals was injected into the air sack of each egg. Blood was withdrawn from the umbilical artery by means of heparinized glass capillaries on the 23rd day of incubation. The serial measurements were automatized and ultramicro techniques were used. An optimized kinetic method was used to determine the SAP activity. Ca and P were determined by colorimetry. The results show that none of the compounds caused a unidirectional, dose-dependent change in the biochemcial values measured, in comparison with the controls which had been injected with distilled water. In contrast, teratological studies using the same pesticides showed a significant, concentration-dependent increase in the number of embryos with bone deformities, similarly to earlier studies using Parathion 20 WP. It is probable that the significant pathological and pathohistological changes are related to changes in other biochemical factors (hormones, vitamins, emzymes, etc.). References 16: 7 Hungarian, 1 Czechoslovakian, 8 Western.

2473
CSO: 2502/93

BIOLOGICAL AND PHYSICO-CHEMICAL PROPERTIES OF THE HUNGARIAN B8/78 STRAIN OF EDS VIRUS

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 36 No 6, Jun 81 pp 420-425
manuscript received 8 Oct 80

ZSAK, Laszlo, Dr, KISARY, Janos, Dr, candidate of veterinary sciences; Hungarian Academy of Sciences, Veterinary Medical Research Institute

[Abstract] The antigenic structure of the domestic B8/78 strain of EDS (egg drop syndrome) virus is identical with strain 127 and its morphological properties are characteristic of the adenovirus. An attempt is made to resolve some contradictions present in the literature with respect to the physical and biological properties of EDS virus, strain 127. The B8/78 strain was grown in the allantoic cavity of embryonated duck eggs (AE virus) and in chick embryo liver cell cultures (Se virus). They were compared based on CsCl gradient centrifugation. The AE virus particles separated into two peaks with buoyant densities of 1.36 and 1.31 g/ml while the buoyant densities of the SE viral populations were 1.33 and 1.31 g/ml. Two methods were used for purification. After preliminary purification without ultracentrifugation and ultrasound treatment, followed by gradient centrifugation (B), the heavy particles preserved their infectiousness and produced hemagglutination while the same virious lost their hemagglutinating activity after ultracentrifugation and ultrasound treatment. The light virious produced hemagglutination irrespective of the method of purification but were not infectious. The virus could be grown equally well in cell cultures of both chicken and goose origin. Viral growth was signified by intranuclear inclusion bodies and by IF positivity in the afflicted cells. Heat and pH sensitivity was comparable to that reported for the FAV 1 (CELO) virus. On digesting the DNA of the virus with R. EcoRI restriction endonuclease according to Sumegi, it separated into four fragments. The molecular mass of the undigested DNA was 23.7 x 10^6 daltons. There was no difference in the protein composition of AE and SE virus strains upon polyacrylamide gel electrophoresis. The protein structure of the heavy virions is characteristic of adenoviruses. Of the 15 protein fractions found, a polypeptide with a molecular mass of 20 thousand was missing from the light virions of both viruses. References 11: 1 Hungarian, 10 Western

2473
CSO: 2502/93

IMMUNIZATION ATTEMPTS AGAINST FOWL CHOLERA

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian, Vol 36 No 6, Jun 81 pp 415-418
manuscript received 18 Nov 80

MOLNAR, Imre, Dr; Phylaxia Vaccine and Nutriment Producing Enterprise

[Abstract] It was attempted to produce a fowl cholera vaccine in which the antigenic structure--with special emphasis on the protein molecule--is not damaged and the protective antigen is present in sufficient concentration. Using ethanol and methanol to treat fermented cultures of virulent P. multocida strains under controlled conditions, a fowl cholera vaccine was obtained which produces satisfactory immunization. Producing reversible denaturation, the two alcohols used do not damage the protein component of the antigenic structure during inactivation thus retaining its biological activity. Collected over several years from acute fowl cholera infections, numerous virus strains from various parts of the country were tested for their virulence in hens. Only the most virulent strains were used for cross immunization experiments. One of the strains (BK_1) was found to yield a vaccine which produced 60-100 percent immunity against all of the strains obtained from 98 foci of infection including its own, under laboratory conditions. The results show that, in Hungary, there is no immunobiological difference among the virus strains producing acute fowl cholera. However, there was great variation in virulence among the strains isolated in the course of individual epidemics. References t: 3 Hungarian, 2 Western

2473
CSO: 2502/93

VIRULENCE OF STRAINS OF THE AUJESZKY'S DISEASE VIRUS ISOLATED FROM SWINE

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 36 No 6, Jun 81 pp 394-]97
manuscript received 17 Mar 81

MOCSARI, Endre, Dr, candidate of verterinary sciences; National Animal Health Institute

[Abstract] Serological screening tests revealed the occasional presence of latent infection in large-scale swine stocks. The study was carried out to elucidate the possible role of the K/61 virus, present in the live-virus vaccine used in Hungary, or of some other, less virulent virus strain in these infections. Isolated from swine cadavers received by the institute, the virulence of 33 strains of Aujeszky's disease virus was tested on 3-4 week mice after intracerebral infection with 100 $TCID_{50}$ doses of the virus. The mice were examined at 6-hour intervals for 7 days. Average time of death ($\overline{DT}$), intracerebral pathogenicity index (ICPI) and the occurrence of pruritus were used as measures. Virus reisolation from the mouse brains was carried out in every case, using immunofluorescence for identification. The cytopathogenic effect of the original and reisolated strains was compared in Vero, IB-RS-2 and secondary swine kidney cell cultures with special attention to syncytium formation. The heat and trypsin sensitivity of 11 strains was also determined. The properties of the K/61 vaccine virus were used for comparison. Based on their ICPI and $\overline{DT}$ values, all strains were virulent. The averages were $\overline{DT}$: 58.29 (48-81) hours and ICPI: 1.41 (1.26-1.62) and they differed significantly (p 0.05) from the K/61 values. Pruritus was present in 69.7 percent of the cases but in none of the mice inoculated with the K/61 virus vaccine. Syncytia were formed by every isolated virus strain in all three types of cell cultures while no such formation occurred during growth of the K/61 strain. The heat and trypsin tests were unsuitable for characterizing the virulence of virus strains.
References 10: 3 Hungarian, 1 Russian, 6 Western

2473
CSO: 2502/93

IMMUNGENIC EFFECT OF SIMULTANEOUSLY ADMINISTERED VACCINES AGAINST VIRAL DIARRHEA (VD) AND CONTAGIOUS HOOF-AND-MOUTH DISEASE (HMD)

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 36 No 6, Jun 81 pp 369-373
manuscript received 7 Oct 80

SZENT-IVANYI, Tamas, Dr, KUCSERA, Gyorgy, Dr, TUBOLY, Sandor, Dr, BOGNAR, Karoly, Dr, KISS, Zsuzsanna, Dr, BERNATH, Sandor, Dr; Veterinary Medical University, Department of Epidemiology, and Institute of Animal Vaccine Control

[Abstract] To clarify practical observations concerning the immunosuppressive effect of VD vaccine, the results of comparative studies are reported. Cattle, in groups of six, were given A: 2ml VD vaccine, i.m. and 5 ml type A, monovalent HMD vaccine, s.c., simultaneously; B: 5ml HMD vaccine, s.c.; C: 2 ml VD vaccine, i.m. Blood samples were taken before and 7 times within 10 weeks after vaccination. Virus neutralization tests were run on the sera and various in vitro tests of lymphocytes obtained from peripheral blood were carried out. The simultaneous administration of the two vaccines did not lower the humoral immune response because the virus neutralization titers were similar in all three groups. The in vivo lymphocyte reactions include: stimulation test measured by autoradiography after ^{3}HTdR incorporation, immune rosette formation, immunofluorescence, inhibition of leukocyte migration and agar gel electrophoresis. Of these, there was no change in blastogenesis and migration inhibition among the three groups. However, during the first three weeks, there was a lowered immune rosette formation (6, 4 and 7 percent) with HMD antigen in the samples of animals receiving both vaccines and the ratio of IaG positive cells reached the level of the other two groups only after six weeks. Infection with virulent HMD virus, carried out on the 66th day, gave similar results in groups A and B. References 28: 8 Hungarian, 2 East German, 18 Western

2473
CSO: 2502/93

COST OF FREE ENERGY IN HUNGARY

Budapest ENERGIA ES ATOMTECHNIKA in Hungarian Vol 34 No 4 Apr 81 pp 153-157

KELLER, Peter, graduate mechanical engineer, Institute of Energy Management

[Abstract] Based on meteorological data collected over a 14-year period, calculations were made to determine the amount of utilizable solar energy over Hungary, considering the monthly average radiation intensities, the sunshine probabilities, and the conversion efficiency of the solar collectors used. The study was aimed at establishing the economic aspects of regional central hot-water heating, using Type NK-220 collectors developed by the ESZKV [expansion unknown] in Barcs. It was found that the amount of recovered energy increases when the required heating-water temperature is decreased; the inclination angle of the collector affects the amount of recoverable energy significantly only if it deviates more than 5 percent from the optimum angle; and the angle-sensitivity increases with increasing collector operating temperature. The concept of annual efficiency was introduced and the energetic and economic aspects of various heating plants were evaluated. The results were used to calculate the realizable savings of fuel oil having a calorific value of 42,000 kJ/kg, used in a boiler of 80 percent efficiency. The economic advantage of solar collectors increased significantly with decreasing heating-water temperature. An attempt was made to express the possible savings in financial terms based on oil-cost projections calculated by various formulas. Under current economic and technological conditions, savings from solar-energy use have a chance of being worthwhile only for applications such as supplying residential hot water and heating swimmingpool water, where the investment costs are much lower than for district residential heating. Figures 13, references 10: 7 Hungarian, 1 German, and 2 Western.

2542
CSO: 2502/97

AGRICULTURAL RESEARCH FOCUSING ON GENETIC ENGINEERING

Bucharest ERA SOCIALISTA in Romanian No 13, 5 Jul 81 pp 14-15

/Article by Academician Nichifor Ceapoiu: "Biology in Aid of the Agrarian Revolution," a report at the interdisciplinary discussion "Nature and Basic Aims of the New Agrarian Revolution in Romania. The Place and Role of Agriculture in the Socialist Economy" held on 19 June 1981 and organized by the Romanian Academy, the Academy of Social and Political Sciences, the Academy of Agricultural and Forestry Sciences and the Stefan Gheorghiu Academy jointly with the journals ERA SOCIALISTA and VIITORUL SOCIAL/

/Text/ The main task of scientific research on agriculture today is to develop varieties and hybrids of agricultural plants with a high productive potential that will meet the requirements for use by agricultural technicians with a low energy input. This calls for use of two kinds of methods, namely conventional, traditional methods of plant improvement for the present stage and other, unconventional methods based on the latest advances in genetics, biochemistry, biophysics etc. for the following stages primarily.

The requirement for a major gain in agricultural production gives rise to a number of priority objectives of research on plant improvement. In connection with use of conventional improvement methods especially, I think these objectives are as follows, in order of their importance:

The first objective is to shorten the vegetation period of all agricultural plants in all ecologic areas of Romania, that of main-crop plants, and that of plants for successive crops under irrigation. Corn presents the most urgent problem because in general its harvesting is considerably rushed in fall.

The second objective is to improve the adaptability of the plants to agricultural mechanization, especially of harvesting operations. I refer to reducing the height of the plants and increasing their uniformity, strengthening their resistance to collapse and breakage, lowering and evening the height of attachment of corn cobs, increasing the uniformity of the cobs and the percentage of grains on them as well as the uniformity of sunflower blossoms, etc.

The third objective is to strengthen the resistance to disease of the various crops, especially those frequently damaged (kidney beans and sunflowers).

The fourth objective is to achieve a greater genetic and ecologic diversity and a more balanced structure of varieties in a crop, in order to prevent susceptibility to diseases and to make better use of the regional environmental conditions.

The fifth objective is to improve the quality of the agricultural products by modifying the chemical composition of the useful substances in the plants.

To be sure further production increases are still the main objective of research, but the chief obstacle to development of productive varieties is the contradiction between the productive capacity and the adaptability of the plants, making it difficult to combine productive properties with early ripening and resistance to frost or drought. Moreover, negative correlations are found between a high productive capacity of the plants and their content of useful substances (sugar or proteins). Yet recent results in plant improvement indicate that a number of these contradictions can be eliminated by using new sources of germ plasm, namely hereditary material.

Inadequate knowledge of the genetic determinism of the plants' quantitative characteristics is another difficulty. The current theories (theory of polygenic systems, theory of action of the pseudopolymeric genes, or theory of oligopolygenic systems) do not provide satisfactory explanations. But many difficult points have been clarified and it is to be expected that this problem will also be solved.

Implications of Genetic Engineering

In the last 2 or 3 years the Fundulea ICCPT /Research Institute for Grains and Technical Crops/ and some improvement centers at the research stations of the Academy of Agricultural and Forestry Sciences have developed and introduced a number of effective varieties and hybrids into production which are contributing to major gains in agricultural production. The Fundulea 29, Lovrin 32 and Bucovina 1 varieties of wheat were developed, with a productive potential of 7,000-9,000 kg per hectare. The 92, 94 and 98 hybrids of corn were developed, which are very early and suitable for successive cultivation and have a productive potential of 5,000-6,000 kg per hectare. And the recently developed corn hybrids like 180, 218, 350, 412 and 420 have a productive potential of 7,000-15,000 kg per hectare. The Sorem 80, Sorem 82 and Florom 305 sunflower hybrids are highly productive and have an oil content of 50-51 percent of dry substance. The new soybean varieties, Precoce 90 and Tomis, developed at the Fundulea ICCPT are much earlier than the varieties now in use and have a productive potential under irrigation of more than 4,000 kg per hectare. They are also rich in oil, proteins, lecithin and phosphatides.

But the question that arises in connection with the agrarian revolution is how far can we raise the productive capacity of cultivated plants by the conventional genetic methods?

Development of wheat varieties that will produce up to 10,000 kg per hectare, corn hybrids that will yield up to 18,000-20,000 kg per hectare, or sunflower hybrids that will produce up to 5,000 kg per hectare entails no difficulties that cannot be overcome by use of convential improvement methods.

But the difficulties will increase when we try to develop "superproductive forms" of cultivated plants that will yield 12,000-15,000 kg of wheat per hectare, 20,000-30,000 kg of corn per hectare, 6,000 kg of sunflowers or soybeans per hectare etc., which yields are to be obtained with minimal energy inputs.

Genetic engineering, one of the youngest branches of genetics, makes it possible to develop superproductive biologic forms with better properties of adaptability. In the true sense of the word, genetic engineering means the "technique of the recombinant DNA," in other words the technique of introducing segments of a gene or whole genes that determine certain properties or characteristics into bacteria or the cells of various plants and animals through the intermediary of such vectors as bacteriophages and plasmids.

In a broader sense, genetic engineering includes the whole system of cultures of cells, tissues and organs in addition to the technique of the recombinant DNA.

The cultures of cells and tissues unexpectedly contributued to in-depth knowledge of the vegetal and animal cells, their omnipotence, the mechanism of cell division and differentiation, the nutrition of the cell and the metabolism of the organism as a whole. Today we can produce any quantity of cells on the basis of a single cell, we can make clones of cells, and we can grow whole plants on the basis of fragments or parts of a plant or even of cells either by organogenesis or directly by embryogenesis in vitro.

A very important part in genetic engineering is played by the protoplasts obtained from the higher plants. By treatment with certain enzymes they can be reproduced, they can form their cellular membrane, and they can be divided to form haploid and diploid plants. But the most important point is that the protoplasts can merge and form the so-called "somatic hybrids" that are highly important for increasing agricultural production. Protoplasts belonging to taxons of a higher species can merge.

Somatic hybridization will permit transfer of genes of great economic importance from the remote forms to plants in order to create superproductive biologic forms. While sexed hybridization between species has rather limited possibilities because of the isolation mechanisms, there are no restrictions at all upon somatic hybridization. Species belonging to very remote taxonomic categories can be crossbred.

Biologic implanting of nitrogen in nonleguminous plants like wheat, barley, corn, sunflowers etc. is a very important field of application of genetic engineering and one that will revolutionize the technology of use of chemical fertilizers.

The most effective way to create the forms that implant nitrogen is to clone a certain region in chromosomes (the nif genetic region) that controls the synthesis of a particular enzyme (nitrogenesis) in the cells of cultivated plants. It became possible to transfer the nif genes from the host-bacteria to the cultivated plants when the technologies for cultivating the protoplasts and constructing the cloning vectors progressed.

Of course there are still many difficulties in organizing and conducting research on genetic engineering, but this is not the place to discuss them.

Long-Range Problems

There are many institutions engaged in genetic engineering in Romania. Some belong to the Academy of Agricultural and Forestry Sciences and others to the various ministries. The studies being made began a few years ago, actually in 1978, when a special program on this subject was drafted at the direction of the National Council for Science and Technology.

We can also point to some results obtained in this brief period. In the case of wheat, barley, corn, soybeans, sunflowers and cultivated vines cell cultures and suspensions were obtained that made it possible to produce somatic hybrods and protoplasts. In the case of potato plants, which are resistant to cultivation of cells and tissues, entire plants have been regenerated by cultivation of segments of the stalk in vitro. In flower cultivation (carnations, orchids, geraniums and chrysanthemums) and fruit growing (strawberries and fruit-bearing trees and shrubs) free forms of viroses were obtained.

In the field of biologic implanting of nitrogen, many cultures of Azospirillum and Beijerinkia were isolated that have the capacity to implant nitrogen in wheat, barley, corn and sunflowers. By use of the recombinant DNA technology vectors were obtained that can transfer genetic information to cultivated plants (vectors represented by the Ti bacterial plasmids). In the same field, particular genes (nif genes) have been transferred from the bacteria implanting nitrogen to some isolated strains of bacteria in the soil.

The results obtained in genetic engineering in Romania are promising though modest. Do not forget that in general the 1978-1980 period was one of personnel specialization, information and documentation, assimilation of working methods and techniques, and supply of equipment and chemicals.

We have effective research personnel inspired by the desire to obtain the most useful theoretical and practical results in this challenging and absorbing field. But the technical-material base of research must be improved, especially as regards procurement of chemical substances. They are hard to come by and expensive, and the same is true of the equipment in many cases.

The current research program meets the production requirements. But the program must be expanded and the research subjects better defined. Improvement of the research methods must be emphasized, as well as introduction of the new methods developed in other countries.

But one essential point must not be overlooked, namely that no newly developed variety or hybrid can yield its genetic potential unless it has optimal conditions for growth and development. On the contrary, the new varieties are much more demanding as to living conditions than the older varieties and especially the local ones, which are better adapted and less demanding but also less productive.

Accordingly the varieties and hybrids developed by the genetic engineering method cannot develop their high productive capacity and become truly superproductive organisms unless all requirements of the respective cultivation technologies are observed. Proper treatment of the soil, application of fertilizers in the prescribed quantities, observance of crop rotations, control of diseases, pests and weeds, punctual and proper harvesting, and optimal preservation of harvests are basic if the new creations are to produce high yields of better quality.

The highly productive forms of plants developed by genetic engineering call for new organizational measures and investments in Romania's agriculture. They will be fully rewarded by the excellent productive properties of these new cultivated plants.

In view of the results so far and the long-range prospects they open up, we are convinced that research on genetic engineering will enter into a more rapid and more constructive phase in Romania, producing the results which are expected in production and which will truly revolutionize agriculture.

5186
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UDC 62-531.001.3

REVIEW OF MICROPROCESSOR CONTROL OF MANIPULATOR ROBOTS

Zagreb AUTOMATIKA in Serbo-Croatian No 5-6, 1980 pp 281-286

[Article by M. Kircanski and O. Dzigurski, Mihailo Pupin Institute, Belgrade; submitted 18 February 1980]

[Excerpts] Table 1 presents a survey of the most important characteristics of several types of manipulators that are commercially available today. The table shows only industrial robots in which digital computers are used for control and for processing the sensor signals, though a large number of commercially available manipulators use encoder matrices and conventional digital control modules.

The conclusion can be drawn from the table that a majority of the manipulators possess 3 ... 6 degrees of freedom, the load weight goes up to a few tens of kilograms, and the maximum speed is about 1 ... 2 m/sec. Electromechanical and hydraulic actuators are used, except that pneumatic drive is usually used for the pickup. The table also gives positioning accuracy during cyclical repetition of the functional movement (this accuracy is determined mainly by the electromechanical tolerances of the system), and it also depends on the manipulator's maximum load weight and ranges from ±0.1 mm to ±2 mm.

The UMS-1 and UMS-2 General-Purpose Industrial Manipulation Systems

The UMS-1 industrial manipulatory system represents Yugoslavia's first industrial manipulator. It was developed through cooperation between the Mihailo Pupin Institute and the Zemun factory Teleoptik. In order to test the characteristics of this system in differing patterns of operation, before the system was built numerous simulations of the manipulator's movements were run on a digital computer by means of a dynamic model of the manipulator [9, 10].

The manipulator's configuration is represented by a minimal configuration of the anthropomorphic type (Figure 3) with three active rotational degrees of freedom and one passive degree of freedom of the pickup [8]. The anthropomorphic configuration has the advantage over other configurations that the manipulator can be applied directly without any sort of adaptation of the work station.

The UMS-1 manipulator system encompacses two subsystems: mechanical and electrical. The electrical subsystem is made up of a digital computer containing the control algorithm and the operative elements: DC motors with appropriate analog servosystems. The digital computer was designed around the Intel 8080 8-bit microprocessor. Programs which generate signals that control the manipulator's movements during performance of the work task and in the learning process are stored in this computer's permanent memory. Learning takes place under the real and dynamic conditions of the manipulator's movements, and the results of learning are used to correct the trajectory when disturbances are affecting the system. During performance of the work task three phases of movement are distinguished as the top of the manipulator moves between the two end points: starting, acceleration and deceleration. A detailed description of the manipulator's control algorithm is given in [4 and 5].

Table 1

Manipulator Model	No of Degrees of Freedom	Max Load Weight	Max Speed	Positioning Accuracy	Type of Activator	Control System	Approximate Price in $
UNIMATE 2000 CONNECTICUT-USA	6	56kg	—	±1,27mm	H+P	MIKRORAČUNAR (1)	50000-60000
PUMA CONNECTICUT-USA	5	2,4kg	$1\frac{m}{s}$	±0,1mm	E+P	MIKRORAČUNAR LSI-11	40000
MILACRON-T³ OHIO-USA	6	136kg	$1,27\frac{m}{s}$	±1,27mm	E+H	MINIRAČUNAR (2)	110000
MIT STANFORD-USA	5	1,5kg	—	±1mm	DC servo sa kočnicama (3)	MIKRORAČUNAR	—
IVO-ARM 6000 CONNECTICUT-USA	6	35kg	$1,5\frac{m}{s}$	—	E or H	MINIRAČUNAR	—
VERSATRAN E-302 VIRGINIA-USA	3	M= (4) 800 lb·in	$60\frac{m}{s}$	±1,27mm	E+H	MIKRORAČUNAR	—
BINKS Illinois-USA		27kg	$1,7\frac{m}{s}$	—	H	16-BIT MIKRORAČUNAR	—
ASEA IRb 6/60 SWEDEN	6	6(60)	$1,1\frac{m}{s}$	±0,2(0,4)mm	DC+P	8-BIT MIKRORAČUNAR	50000
SIROBOT-2 Siemens-W. Ger.	6	20kg	$1\frac{m}{s}$	±1mm	DC	MIKRORAČUNAR	40000
EW-508-1 JAPAN	6	—	—	±1mm	E	MIKRORAČUNAR	—
UM-1 USSR	3	40kg	—	±2mm	H	PROGRAMATOR SA SISTEM SA BUŠ. TRAKOM (5)	—
UMS-1 Yugoslavia	3	0,5kg	$0,5\frac{m}{s}$	±1mm	DC	8-BIT MIKRORAČUNAR	20000
UMS-2 Yugoslavia	5	2kg	$1\frac{m}{s}$	±1mm	DC	8-BIT MIKRORAČUNAR	35000

Key:
1. Microcomputer
2. Minicomputer
3. DC servo with brakes
4. M = 800 lb in
5. Encoder system with punched tape

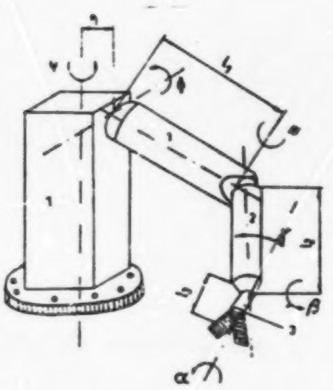

Figure 3. UMS-1 industrial manipulator.

The microcomputer which controls the system also possesses a large number of output registers, which are used to control the pickup, to synchronize the operation of the manipulator and other systems in the work space (for example, of presses and the like), and so on. The UMS-1 industrial manipulator system is furnished with tactile sensors on the inner side of the pickup, which makes it possible to monitor the correctness with which the manipulator system is operating.

The UMS-2 general-purpose manipulator system is the second of the series of lightweight industrial manipulators, and once again it was designed in the Mihailo Pupin Institute in Belgrade [11, 12]. The manipulator possesses three degrees of freedom in its basic configuration (one rotation and two translations), and three degrees of freedom of the pickup (three rotations) (see Figure 4). DC electric motors are the actuators of all the degrees of freedom.

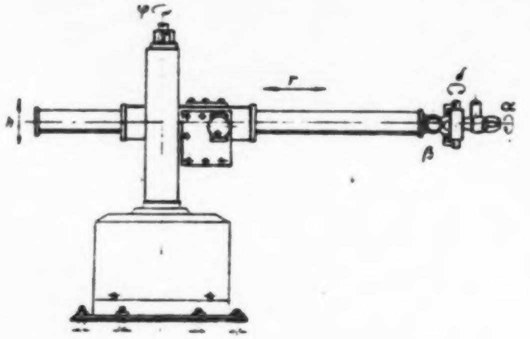

Figure 4. UMS-2 general-purpose manipulator system.

The manipulator's control system uses an 8-bit microcomputer* and an analog position-speed servosystem. The configuration of the microcomputer consists of a

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* DARTA-80, a microcomputer developed in the Jozef Stefan Institute in Ljubljana.

RAM [(?) random access memory] memory with a minimum capacity of 1 k x 8 bits, which can be expanded with modules of 4 k, an EPROM [(?) electronic processor memory] memory, also in modules of 4 k x 8 bits, 40 digital input and output channels, interface for video display or teleprinter, and provision has also been made for connection to digital cassette or floppy disk.

The work task is programmed simply by giving commands through the video display. The programming process is made still easier by the manipulator's configuration, which corresponds to the cylindrical coordinate system.

In view of the weak coupling that exists between the various degrees of freedom, a separate servosystem has been designed independently for each actuator. This manipulator's servosystems are based on pulse width modulation and ensure a broad range of linearity.

The control part of the UMS-2 system also provides for the processing of signals from sensors of various types, from the simplest sensors that generate 1-bit pieces of information all the way to the more complicated types of sensors (sensors of force, ultrasonic sensors, surface tactile sensors, and so on).

3. Lines of Development of Industrial Manipulator Systems

The requirements which are imposed on industrial manipulators are today numerous and complicated. These are, first of all, the requirements of achieving maximum independence in the operation of the manipulator, the requirements for increased versatility of manipulator systems, and the requirements for higher speed and positional accuracy.

It is very important to reduce the need for human intervention in the operation of the manipulator system. It, first of all, makes it necessary to use a maximum number of sensors in the feedback circuits of the control systems, but it also embodies a demand for higher reliability and operating accuracy of the manipulator system. The capabilities of industrial manipulators can be expanded considerably if a sensor-interactive computer is introduced into the control system. This makes it possible to achieve adaptivity of the manipulator system. Adaptivity is the manipulator's ability to correctly perform its work task even when changes occur in its work space. If the manipulator is to be adaptive, the control system must be constantly monitoring the condition of the environment and the state of the manipulator system, that is, it must be equipped with a sufficient number of sensors furnishing the data for making decisions on its further operation [2].

Sensors which can be put to very worthwhile use in a manipulator-pickup system might be these:

1) Sensors of position, speed and acceleration.

2) Sensors of force with several degrees of freedom for measuring forces and moments affecting the system from outside.

3) Sensors of force on the pickup to monitor grasping force.

4) Optical sensors for analyzing the work space.

5) Surface tactile sensors to determine the shape of the pickup's area of contact and of the workpiece and detection of slippage of the workpiece.

6) Ultrasonic sensors to measure the distance to some obstacle or to the workpiece.

7) Safety sensors to detect the possibility of an imminent collision between the pickup and an obstacle.

8) A "whisker" sensor to study the pickup's contact with surrounding objects.

Figure 5 shows the pickup of a manipulator system with one of the possible arrangements of the types of sensors which have been mentioned.

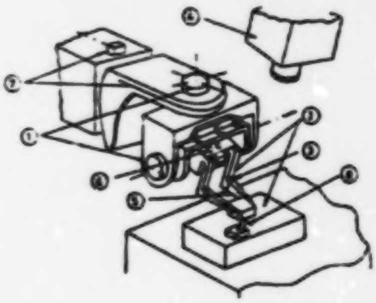

Figure 5. System of sensors on the manipulator's pickup.

Use of a complex sensor-interactive control system is also an elegant way of solving one of the most common problems in industrial manipulation--the problem of feeding workpieces, which up to now has been solved either by mechanical systems or by means of a human operator. It is now possible for the piece to be picked up from a moving belt, which is making it easier to apply robots in industrial practice.

However, the sensor-interactive manipulator system requires a very large computer effort, so that up until recently sensor-interactive manipulator systems were built only with minicomputers with a rapid processor and a very complicated operational system. Manipulator systems with such computers carry a very high price. Today, however, it is possible to replace the minicomputer with a set of microcomputers linked up in multiprocessor operation [1]. In such a system the individual microcomputers would have the task of processing signals from one or more sensors for monitoring the servosystems of particular joints, while one main microcomputer would coordinate the operation of the entire system. Each microcomputer is programmed entirely independently, since the hardware ensures that only one microcomputer has access to the common memory at any particular time. Thus the complicated operational system and speed of the minicomputer are replaced by the parallel operation of several microprocessors, and the price of such systems is considerably lower. A system of this type is illustrated by the block diagram given in Figure 6.

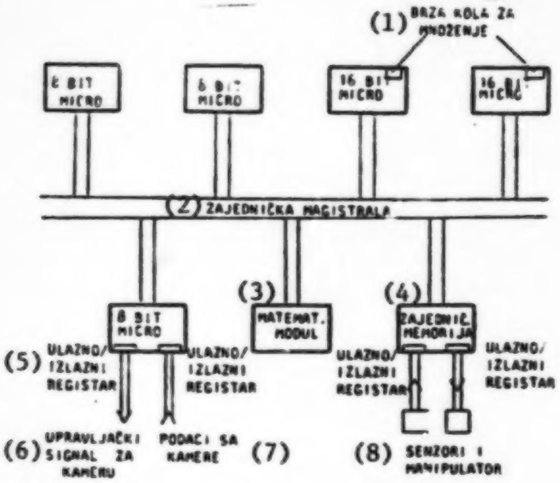
(1) BRZA KOLA ZA MNOŽENJE
8 BIT MICRO
8 BIT MICRO
16 BIT MICRO
16 BIT MICRO
(2) ZAJEDNIČKA MAGISTRALA
(3) MATEMAT. MODUL
(4) ZAJEDNIČ. MEMORIJA
8 BIT MICRO
(5) ULAZNO/IZLAZNI REGISTAR
ULAZNO/IZLAZNI REGISTAR
ULAZNO/IZLAZNI REGISTAR
ULAZNO/IZLAZNI REGISTAR
(6) UPRAVLJAČKI SIGNAL ZA KAMERU
PODACI SA KAMERE (7)
(8) SENZORI I MANIPULATOR

Figure 6. Example of the configuration of a multiprocessor system.

Key:
1. Fast multiplication circuit
2. Joint line
3. Mathematical module
4. Common memory
5. Input and output register
6. Control signal for the camera
7. Data from the camera
8. Sensors and manipulator

Another demand which is imposed on today's industrial manipulators, the demand for achievement of maximum versatility of manipulator systems, is manifested in the need for simple and rapid reprogramming of the robot to perform new work tasks. Specialized and higher program languages for the description of work tasks which can also be used in one of the microcomputers in the multiprocessor system are offering large opportunities in this respect.

Higher speed and accuracy of operation of industrial manipulators is also an essential precondition for maximum effectiveness in use of manipulator systems in industrial practice. One of the algorithms that would certainly increase the manipulator's speed of movement and increase its accuracy is the use of dynamic control.

Possibility of Implementing Dynamic Control on a Microcomputer

Kinematic control of manipulators, which means that the desired trajectories of the internal angles of the various degrees of freedom are generated at the analog outputs of the microcomputers, has been used in most of the control systems based on the microcomputer to date. These signals are then led to the inputs of the respective robot servosystems through which the desired positional accuracy is attained at the cost of large amplification. But dynamic control of manipulators is proposed, however, to increase the speed of operation of the manipulator and positional accuracy without unnecessary reserve power on the part of the actuator [6]. Two-stage synthesis of the control system is adopted in dynamic control [7]. In the first stage it is necessary to synthesize the kind of control that would ensure movement of the system along the desired trajectories when the system is not affected by disturbances of any kind. In the second stage there is a need to provide for satisfactory monitoring of the given trajectories even in the case of disturbances to the system.

This concept of control can be achieved with microcomputers only if high-performance microcomputers are used with a high-speed "floating point" processor and a sophisticated operational system.

The functions with the microcomputer is to perform in the first stage, the stage of synthesis of nominal control operations, are the following: a) to determine the generalized internal angles of the manipulator on the basis of the given positions of the top of the manipulator and the orientation of the pickup along the nominal trajectory (this requires determining the Jacobian transformation of external angles to internal angles and its inversion), b) to determine the generalized drive moments in the joints, that is, the nominal control instructions at the inputs of the actuators. The procedure for synthesizing the nominal control instructions of the microcomputer should be performed in the learning process, and a sequence of nominal program control instructions should be formed as a result of that procedure.

In the second stage, during performance of the work task, there is a need for the microcomputer to generalize program control instructions and to furnish feedback connections in order to ensure satisfactory monitoring of the nominal trajectories. The feedback signals on position, speed, moments and forces in the joints should be measured and processed in the microcomputer and then converted to the appropriate analog signal and sent to the servosystem. Dynamic control of the manipulator cannot at present be achieved in real time on the microcomputer, but possibilities exist for developing somewhat simpler dynamic models which would be used as the basis for control algorithms that would result in higher speed and positional accuracy.

For the sake of performance of all these functions on the microcomputer it is convenient that the microcomputer have "floating point" arithmetic instructions, the possibility of programming in some higher program language (PL/M, BASIC or FORTRAN, and so on), a library of programs with trigonometric functions, operation with matrices, and so on.

4. Conclusion

The strong development of microprocessors over the last several years has brought about a qualitative leap in the capabilities of control systems of industrial manipulators. The emergence of the new 16-bit microcomputers, which are software-compatible with their 8-bit predecessors, will result in a still faster development of industrial manipulator systems. Their use will afford the following possibilities at a relatively low cost: a) dynamic control of manipulators on the basis of complex control algorithms (up to now control was based mainly on a kinematic model of the manipulator), b) processing of signals from sensors, including the most complicated types of sensors (TV cameras), c) introduction of higher specialized program languages for interactive communication with the system, and so on. Although many of these possibilities have already been achieved in development laboratories, the new 16-bit processors will make it possible to implement these functions even on commercially available industrial manipulators. The further development of industrial manipulators will result in a further price drop, higher speed and positional accuracy, and greater reliability, versatility and adaptability of industrial manipulators.

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East Europe Report

SCIENTIFIC AFFAIRS

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EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

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WEST GERMAN STUDY: ILLEGAL TECHNOLOGY TRANSFER TO CEMA CONTINUES

Zurich NEUE ZUERCHER ZEITUNG in German 12 Sep 81 p 16

[Unattributed article: "Flourishing Illegal Technology Transfer in CEMA--East Interested in Computers and Microelectronics"]

[Text] As revealed in a report from the research office for all-German economic and social questions in Berlin, in spite of the narrowing of the technological gaps between East and West in EDP and microelectronics the interest of the communist countries in these developments has not diminished. Sensing increased illegal East-West exports of technology, especially in the sector of microelectronics, consideration is now being given in Paris to expanding the embargo list of the Committee for Coordinating East-West Trade (Cocom).

East European Push to Imitate

In the course of time four different forms of technology transfer have developed: Computer purchases, including peripheral equipment and software within the framework of normal trade relations between East and West; licensing of CEMA companies by EDP manufacturers; establishment of joint ventures for the production and sale of EDP products, as, for example, ROM Control Data in Romania; illegal technology transfer.

In addition, adaptation and adoption of Western technology were likewise successfully practiced by CEMA countries. Thus, it is not by chance that the two lines of development of the common CEMA computer families of the uniform electronic data processing system (ESER), in the West often known also by the Russian term ryad, show similarities with the IBM 360 and 370 systems.

Following the introduction of their first universal computer families, ESER 1 (since 1972-1973), the strategy of the CEMA countries became clear: By adapting and adopting hardware and software of the EDP technology of IBM, the leader in the Western market, their own basic research and development could be supported, pushed forward and be freed of possible faulty developments. ESER 1 involves imitating the IBM 360 system which, however, was still modernized to some extent. Thus, from the memotechnical code of the assembly instructions to the channel system and the peripheral equipment, the entire ESER is compatible with IBM which not least made the use of the corresponding IBM software easier. Hungary's ESER model EC 1010 was the only exception to this.

The ESER development series 2, in series production since 1978-1979, is extensively identical with the IBM 370 system. The only exception is the Soviet large computer EC 1065 which is said to be comparable to the IBM 3033 system. Thus, CEMA development engineers of the ESER can also use the software of the IBM 370 and 3033 systems to their advantage to the extent they can get at them.

Since the beginning of the 1980's research and development work for the new series 3 of the ESER (ryad 3) has been in progress; production is planned to start in 1982-1983. Certainly this series of models will also be designed in such a way that at least the capabilities of Western technologies can be used.

Progress With Western Help

In the past few years most of the CEMA countries have developed miniature and microcomputers which, meanwhile, are now also being series produced. The no doubt most obvious characteristic of some of these computers is the fact that they contain components from Western firms and that components and equipment are produced with Western licenses. The reason for recourse to proven Western technology, an action acknowledged in part in customer information brochures, is the fact that such CEMA products are to be sold mainly in Western markets in order to yield foreign exchange. But even when used in their own countries, computers equipped with Western chips must demonstrate scientific-technical progress in socialism. CEMA's miniature computer families (system of miniature computers, abbreviated SKR), are based in part on the systems of Hewlett-Packard and Digital Equipment Corp.

Using Western findings is likewise characteristic of the microelectronics sector. Nevertheless, CEMA did not initiate establishment of its own microelectronics industry until later than in the West. In the GDR, for example, there was no reference to microelectronics either in the directive to the 1976-1980 Five-Year Plan nor in the approved text of the 5-year plan. Not until June 1977, by means of a resolution at the sixth meeting of the Central Committee, was acceleration of the rate of development in this industrial branch set forth because of the overall economic importance of microelectronics, and the first basic steps were taken. In order to keep the West's headstart in development, which had meanwhile been moving forward, from getting any bigger, research in the GDR was extensively oriented to the proven findings of leading U.S. chips producers as, for example, Texas Instruments or Itel. The purchase of Western technology was, of course, costly, yet as a rule never involved difficulties of any magnitude. According to a report in the February 1981 party newspaper NEUES DEUTSCHLAND, users in the GDR have "access to an assortment of 719 types of components, including 210 integrated circuits.

Capitalists as Stopgaps

In the USSR, according to a report in PRAVDA, 3 November 1980, "hundreds of thousands of microprocessors in 10 types, thousands of microcomputers and millions of other microcomputers in 13 types" were produced in 1980. Even in other CEMA countries series production of integrated circuits has been under way for some time. In spite of these production successes, however, the existing gaps in the East must continue to be filled by the "capitalists."

In spite of the Cocom embargo list, which prohibits exporting certain computers and microelectronics, the illegal technology transfer from West to East is flourishing. The NATO regulations could, of course, be thoroughly circumvented by resourceful businessmen. The FRG in particular does not take observance of the regulations too seriously.

Beyond Legality

Thus, for example, there is a number of companies both in Berlin and in the rest of the FRG which function as initiating institutes for exporting technology to the East. American technology was sold to the Soviets via the FRG. Key components for missiles and satellites as well as small flight computers are said to have been among the Western knowledge sold. Of course, it is completely legal to buy such components in the United States, but not to go on to sell them to the USSR. Naturally the Russians participate very actively in the technology sellout. The Soviet secret service supports an extremely thoroughly organized network of European businessmen in the United States who purchase highly developed technology for Moscow in a systematic way. In addition, according to American statements, Soviet students have sought out very interesting fields of study at American universities, for example, fields in the electronics sector, and, thus, in this way they gain access to important scientific-technical findings.

Obviously even U.S. businessmen are ready to serve the Soviets if the price is "right." In the course of a routine investigation a ship's cargo with extremely efficient components, including combat computers and technology for battle with and by helicopters, was seized by the customs authorities in California. The containers with the products mentioned had already been loaded onto the Russian freighter, and according to the manifest they ostensibly contained washing machines and electric ranges. Irrespective of the political developments in recent times, even well-known American companies are seeking, partly in concert with their Soviet business partners, ways to circumvent existing export barriers.

However, the American export ban on high quality technology to the USSR following the intervention in Afghanistan does seem to have had an effect. The American behavior has been repeatedly deplored by prominent Soviet scientists.

12124
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REPORTS, COMMENTS, DESCRIPTION OF 'INTERKOSMOS-BULGARIA 1300' SATELLITE

Interkosmos-Bulgaria 1300 Satellite in Orbit

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 pp 1,6

[BTA Report]

[Text] Moscow, 7 August. Today the Interkosmos-Bulgaria 1300 satellite was fired into orbit. The satellite's main purpose is the continuation of comprehensive studies of physical processes occurring in the earth's ionosphere and magnetosphere.

The satellite's orbit has the following parameters:

Maximal distance from the earth's surface (apogee), 906 km;

Minimal distance from the earth's surface (perigee), 825 km;

Orbital inclination, 81.2°;

Initial orbital period, 101.9 minutes.

The scientific equipment installed in the satellite was developed and manufactured by Bulgarian scientists with the help of Soviet scientists. Its purposes are the following:

Study of the ionospheric plasma and high-energy flows of charged particles;

Study of direct and alternating electric magnetic fields;

Study of the light in the upper atmospheric strata in the ultraviolet and visible range of the spectrum.

In addition to the scientific equipment, the Interkosmos-Bulgaria 1300 satellite contains the following: A system ensuring a permanent orientation of the satellite toward the earth; a system for electric supplies with autonomous orientation of the solar batteries toward the sun; a radio system for precise measurement of the orbital elements and a radiotelemetric system which transmits to earth data on the work of the satellite's equipment.

According to telemetric measurement data, the systems aboard the satellite are operating normally.

The earth stations of the command-measurement complex of the Soviet Union are regularly receiving the scientific data transmitted by the satellite.

The data will be processed and analyzed by scientific organizations in the Soviet Union and the Bulgarian People's Republic.

Warm Congratulations

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 p 1

[BTA Report]

[Text] Moscow, 7 August (Tass). Leonid Brezhnev warmly congratulated Todor Zhivkov on the occasion of the remarkable event: the launching of the Interkosmos-Bulgarian 1300 satellite.

Todor Zhivkov expressed his warm thanks for the opportunity to participate in joint studies of outer space.

Remarkable Bulgarian Achievement

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 pp 1,6

[Article by Dimitur Gornenski, RABOTNICHESKO DELO special correspondent]

[Text] Moscow, 7 August. Report from a Soviet cosmodrom.

This was a happy day for anyone who had the opportunity to witness the launching into the blue sky of Interkosmos-Bulgaria 1300, the latest man-made star. As the project of Bulgarian and Soviet scientists and specialists, with this launch it entered the history of space research as a remarkable achievement of our science: for the first time a space apparatus entirely equipped with a variety of instruments for complex and precise measurements and experiments developed and created by a big collective of researchers of the Central Laboratory for Space Research and other Bulgarian scientific centers is circling the earth.

The star began to shine brightly with the powerful light of the rocket engines against the background of a beautiful Russian forest. It crossed the horizon of this huge country and rose above the launching field to follow the trajectory computed by the daring, skill and faith of dozens of its creators. The rocket launch was brilliant. When the order "take off" was issued at the command center, I glanced at our cosmonaut Engineer Col Georgi Ivanov, who was standing on the special guest platform. He was tensely waiting for the supreme moment and was probably reliving the time of his own launching into space together with Nikolay Rukavishnikov aboard the Soyuz-33 Soviet spaceship which was launched into orbit with the same type of rocket.

Present at the cosmodrom, decorated with slogans in the Bulgarian language, were noted Soviet scientists and designers and Bulgarian specialists.

Also present was a Bulgarian delegation headed by Ognyan Doynov, Politburo member and BCP Central Committee secretary.

The excitement of the guests lasted a long time. The engines brightly lit up and the powerful rocket smoothly rose over the launching pad. Two minutes later the first stage separated and a light, bright cloud hung over us. All the eyes followed the trajectory of the bright light rising in the distance. About 250 seconds after the launch, the report was heard that the second stage had separated. The brilliant dot was no longer visible in the air but the numerous guests remained silent, waiting for subsequent reports. When the loudspeaker reported that "The flight is proceeding normally. There is separation of the third stage!" applause broke out and there were firm handshakes, embraces and kisses, exclamations and expressions of unconcealed joy. Interkosmos-Bulgaria 1300 was starting its first orbit around the earth.

I remembered at that time the infinitely interesting hours of the last preparations for the launch. In the morning, in the company of a group of Bulgarian and Soviet scientists, we visited the launching area. The huge rocket was standing in front of us in the sunlight. The letters "Interkosmos-Bulgaria 1300" were visible on its second stage and the letters "USSR" were on the orange-colored third stage. There, at the top, with its brilliant silvery metal cover, was the concealed satellite of the "Meteor" type with a number of improvements, containing the 12 scientific instruments of the first part of the Bulgaria 1300 space research program. Later, together with the developers, we saw the duplicates--a multicolored series of apparatus, many of which are considered by the Soviet specialists as one-of-a-kind achievements of Bulgarian scientists, designers and engineers. My interlocutors frequently stressed that any advanced country in the field of space research of the ionosphere, magnetosphere and earth's atmosphere as well as other areas of space close to our planet could be proud of such a set of precise instruments. More specifically, so far such programs have been implemented or designed only by the Soviet Union, the United States, France and Italy. In this very small circle, Bulgarian science is entering with its own program which so far has been rated exceptionally highly by the most prestigious Soviet experts. The implementation of this program was approved by a special commission which did not issue a single remark. The most fitting expression in this case is that "No comment is needed."

The launching of the new satellite and its normal start is a success which dates back to 10 July when the Meteor-Priroda satellite equipped with a set of scientific research instruments developed by Bulgarian and Soviet scientists was launched as the second part of the Bulgaria 1300 research program. Such brilliant starts mark our great 13-century anniversary of the founding of the Bulgarian state. However, they also crown the peaks reached by our homeland in the course of the building of socialism, thanks to the tremendous fraternal and selfless support of the USSR. The Bulgarian scientists and specialists conquered these heights thanks to their joint work with the collectives of a number of Soviet scientific centers, plants and auxiliary organizations. Both spaceships were launched in orbit with the help of the tested Soviet space technology and from Soviet cosmodroms. In the course of the 2 years of selfless labor for the implementation of the Bulgaria 1300 space research program, not only scientists, engineers and technicians from the main areas engaged in the study and utilization of outer space in our country were involved but workers and specialists of many industrial enterprises in Sofia, Plovdiv, Stara Zagora, Kazanluk, Panagyurishte and other cities.

Actually, the implementation of this program is the project of a thousands-strong collective of Bulgarian and Soviet scientists, designers, engineers and workers, described by Comrade Todor Zhivkov in the course of his participation in the procedings of the 26th CPSU Congress and his meeting with the collective of the Institute of Space Research of the USSR Academy of Sciences as the "powerful Soviet-Bulgarian scientific research complex."

That is what is hidden behind the inscriptions on the rocket which, in today's sunny afternoon, took into orbit the bright star of our friendship, love for and brotherhood with the Soviet people and which, together with the Meteor-Priroda, will yield important results for the further development of basic research and the solution of many practical national economic problems in which the entire world is tremendously interested.

Professor Comments on Interkosmos-Bulgaria 1300 Flight

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 pp 1,6

[Article by Corresponding Member Prof Dr Kiril Serafimov, scientific observer for RABOTNICHESKO DELO]

[Text] The idea of the development of a new space project belongs to a few enthusiastic Bulgarian specialists who suggested to Academician B. N. Petrov (the then-chairman of the Interkosmos Council) in 1975 the creation of a satellite for the study of plasma, electromagnetic and optical manifestations of magnetospheric-ionospheric interaction. In 1977 the Bulgarian scientists submitted this original space project for discussion. This marked the beginning of a profound joint discussion held by Bulgarian and Soviet collectives and of the improvement and implementation of this space project whose essential scientific significance consists, above all, of the aptly-selected study target--magnetospheric-ionospheric interactions and reciprocal influences.

The study of magnetospheric-ionospheric interaction is interesting above all from the basic-cognitive viewpoint in learning about the phenomena, processes and physical characteristics of space around the earth. Such studies are quite important also from the viewpoint of plasma physics, for plasma processes are taking place in the magnetosphere and ionosphere in a free, noncontained aspect which is difficult to duplicate under laboratory conditions. Finally, magnetospheric-ionospheric interactions are the most important and understudied segment of the tremendous bridge of life which links the sun with the earth.

The main idea of the experiments and of the instruments aboard the Interkosmos-Bulgaria 1300 satellite is the study of an optimal number of basic and determining parameters and values in the two interacting media--the magnetosphere and ionosphere--as well as their reciprocal influences through electrical and magnetic fields and transfer of matter. Bearing in mind the spatial separation of the basic areas of interaction, it is very difficult for a single satellite to carry out this task. For example, in the current Dynamic-Explorer American program, similar problems are being resolved by two satellites, one of which follows a very flat elliptical orbit. A different and original system for determining the parameters of interaction was chosen for the Interkosmos-Bulgaria 1300 satellite. The electrical connections between the two media and the exchange of energy and matter between them are measured at ionospheric altitudes. The quantitative evaluation of the processes and phenomena taking place in the magnetosphere is based on their effect on the ionosphere, thus making the use of a second satellite unnecessary.

In order to resolve the scientific problems, a set of satellite instruments, which includes four groups of a total of 12 systems, apparatus and installations, was designed and manufactured in Bulgaria. Many of the new methods, technologies, elements, means, inventions, solutions and other developments which led to the original equipment for the satellite may be applied in industry and other practical areas with a high degree of effectiveness.

The fact that during that period four other satellites will be functioning, pursuing almost simultaneously similar or complementary objectives and tasks, is of great importance. They include two American satellites, the Arcade French-Soviet satellite and the San Marco Western European satellite. This offers great opportunity for the development of international space cooperation which, in addition to its scientific value, can also be a factor for peace and detente on earth.

This major space project is the result of the successful development of a number of basic scientific and technical and industrial fields in socialist Bulgaria, such as electronics, electrical engineering and machine building. The Bulgarian-Soviet space collective is dedicating its new great space success to the 13 centuries of existence of the Bulgarian state. This satellite marks the final stage of the implementation of the comprehensive Bulgaria 1300 space project, in the course of which several Bulgarian systems and apparatus were used on the Meteor-Priroda Soviet satellite, which was launched on 10 July 1981.

The new joint space flight is yet another brilliant manifestation of Bulgarian-Soviet friendship and fruitful scientific and technical cooperation in space. Bulgarian scientists and specialists learned from Soviet science. They were trained or practiced in the Soviet Union. They drew ideas and information from their Soviet colleagues and received a number of consultations, material and technical assistance and the exceptional opportunity to use the latest Soviet laboratories and technological testing and other equipment. The Soviet experience in organizing, directing and controlling major scientific and technical space collectives working on big target programs was particularly useful.

The attention and energetic support of the BCP Central Committee and CC CPSU and, particularly, the personal concern of Comrade Todor Zhivkov, BCP Central Committee general secretary and State Council chairman had a great stimulating influence and played a main role in the successful implementation of this space project. In the course of Todor Zhivkov's visit to the USSR, where he attended the 26th CPSU Congress, he was shown the final assembly and testing operations of the satellite.

The friendship and joint efficient and fruitful organization of the scientific and technical groups of the two fraternal countries in charge of implementing the program strengthened in the course of work on the Bulgaria 1300 space project. One of the main results of the implementation of the Bulgaria 1300 space project, which can be reported now, was the development of a large and highly skilled Bulgarian-Soviet space collective which can resolve difficult contemporary space scientific and technical problems.

The new joint satellite proves to the world the great scientific and technical, economic and comprehensive achievements of a small and formerly backward country--Bulgaria--which under the conditions of socialism and fraternal friendship with the Soviet Union, is now confidently assuming its place in the leading ranks of mankind's offensive in outer space.

Reliable Equipment Created

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 p 6

[Article by Stanislav Kolev, RABOTNICHESKO DELO special correspondent, Stara Zagora]

[Text] There is restlessness in the silent beauty of the V. I. Lenin park near the city. A particular kind of "magnetic" field, which draws the efforts and energy of construction and scientific workers and the hopes and expectations of every Bulgarian has developed near the silvery dome of the Yuriy Gagarin base laboratory of the Central Laboratory for Space Research of the Bulgarian Academy of Sciences. The reason is that soon the first signals sent by the Soviet satellite, which is already flying in space, bearing the name of our centuries-old state, will be heard here soon.

In the "breathless" hours of the final preparations, I met with Senior Scientific Associate and Candidate of Physical Sciences Mitko Gogoshev, head of the collective: "The tasks which will be performed by the Bulgaria 1300 satellite are part of the Interkosmos program. The satellite contains 12 Bulgarian-manufactured apparatus through which the 'arc' experiment, undertaken aboard the Soyuz-33 by Col Georgi Ivanov, will be continued. Most of this equipment was designed and developed by our collective. Some of the instruments for the reception, recording and processing of expected data were also created by us. The two-column scanning EMO-5 electrophotometer was developed under the direction of Engineer Neno Petkov; the Proton-1 proton spectrometer was manufactured by a team headed by Kol'o Kazakov; the vacuum ultraviolet scanning spectrometer was developed by scientific associate Stoyan Surgoychev and his associates. However, we do not deserve the entire credit, for this equipment was prepared with the active help of our colleagues in the Soviet Union and the cooperation of the Beroe and Cherveno Zname memory systems plants in Stara Zagora.

All of us were waiting for the flaming start of the carrier rocket. It was awaited by scientists and specialists at the Yuriy Gagarin observatory, whose minds and actions were focused on the secret of starry space. It was awaited by academicians, miners and rural workers, for it will provide new opportunities for our national economy! It was awaited by the construction workers of the brigade headed by Georgi Atanasov, with technical manager Raycho Banov, of the second construction rayon in Stara Zagora. These masters, who had so far built factories, plants, schools and houses, had now built the first space center of the homeland. In a few days its antennas will be receiving the initial signals of the Bulgaria 1300 satellite which will calmly record yet another major step taken along our socialist path and once again with the fraternal aid of the great land of the soviets.

Integration Project

Sofia RABOTNICHESKO DELO in Bulgarian 8 Aug 81 p 6

[Text] Interkosmos-Bulgaria 1300 is orbiting the earth. The news of its launching triggered the enthusiasm and gratitude of the entire nation. They were specifically addressed to our scientists who, within a relatively short time, were able to develop scientific systems and apparatus for this satellite.

The news of the launching of Interkosmos-Bulgaria 1300 satellite was received by the people as yet another convincing manifestation of comprehensive Bulgarian-Soviet cooperation. The service systems and the hull of the satellite, which are the vivid embodiment of its constructive force, are the work of the skill, ambition and creative efforts of Soviet engineers, mechanics and workers.

Interkosmos-Bulgaria 1300 is a phenomenon of great national importance. It is a new brilliant confirmation of socialist integration in the study of outer space and a major success of Bulgarian electronics, electrical engineering and machine building. Formerly neglected agricultural Bulgaria is today among the technically advanced countries and is a convincing example of the possibilities and prospects of our progress toward developed socialism.

The thought that modern Bulgaria is making its contribution to the conquest of space and to the utilization of the results of space research for peaceful purposes triggers the patriotic pride of everyone. It increases our love for the Soviet Union and supports our infinite faith in progress.

5003
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OBJECTIVES OF 'INTERKOSMOS-BULGARIA 1300' SATELLITE OUTLINED

Sofia OTECHESTVEN FRONT in Bulgarian 18 Aug 81 p 1

[Article by Yuriy Zaytsev, department head, USSR Academy of Sciences Institute of Space Research: "The Ionosphere-Earth Bulgarian-Soviet Bridge"]

> [Text] Advantages of the "Interkosmos-Bulgaria 1300" program; the experiments are focused on the study of upper atmospheric strata--one of the main tasks of the science of earth.

Moscow. Special for OTECHESTVEN FRONT

We are witnessing the successful implementation of a new comprehensive space program drafted by Bulgarian and Soviet specialists for the Interkosmos-Bulgaria 1300 satellite. The main purpose of the project is to obtain data which will make it possible to unravel the secret of the transfer of energy from the sun to the earth through time and space.

The mystery of our sun has long excited not only astrophysicists. The tremendous plasma processes taking place on the sun (spots, eruptions and so on) characterize so-called solar activities and influence the condition of the magnetic field and the atmosphere on earth.

The structure of the ionosphere changes constantly under the effects of solar radiation. In turn, this also means a change in the conditions governing the penetration of solar energy down to the earth's surface. Many secrets of nature, related to shaping the weather and climate on our planet, are concealed in the ionospheric processes. Furthermore, in the ionospheric plasma radio waves cannot spread as freely as in the air. In the plasma they are absorbed and refracted. These processes are directly related to the condition of the ionosphere and to its characteristics. The study of ionospheric dynamics helps us to surmount difficulties in establishing long-range radio communications.

In turn, the physical processes which take place in the ionosphere are closely related to and largely determined by phenomena in more distant areas of space around the earth, in its magnetosphere. The study of such processes requires the measurement of electric and magnetic fields and of flows of vast charging particles. It is also important to record the aurora borealis which are caused by the penetration of such particles into the atmosphere and the ionosphere. Therefore, it is a question of conducting comprehensive studies and comprehensive experiments. Such is precisely the program being implemented aboard the Interkosmos-Bulgaria 1300 satellite.

We must emphasize that this program offers a number of advantages compared with previous similar programs.

Above all, such measurements are taking place in a period of increased solar activity. Never before have such broad studies been conducted with the help of scientific equipment developing on the basis of a single program. Thirteen instruments have been mounted aboard the satellite, 12 of them, including the laser angle reflector, are of Bulgarian manufacture.

The planned duration of the active life of the satellite will enable us to make measurements in the different seasons of the year and with different variations of the shady part of the orbit and different positions of the orbit in terms of the sun-earth axle.

The high precision of the satellite's orientation, combined with an advanced system and guidance control, will ensure the high quality of the received data.

Bulgarian space science reached the beginning of the Interkosmos-Bulgaria 1300 satellite program with a solid scientific package. Bulgarian scientists participated in all the aspects of the studies based on the Interkosmos program, such as direct measurements from satellites and rockets, ground measurements and theoretical research. Bearing in mind the existence of relatively strong ionospheric and space radiation research groups in Bulgaria and the developed state of Bulgarian electron, electrical engineering and optical industry, priority was given to space physics and space instrument manufacturing. The Bulgarian specialists are high-grade specialists in ionospheric and magnetic studies in space research. That is why it is natural that the experiments they prepared were focused mainly on the study of the upper strata of the earth's atmosphere, which are ionized and are known as the ionosphere.

In the course of joint work on the Interkosmos program, Bulgaria developed highly skilled specialists who are successfully creating complex scientific equipment for space research.

Bulgarian-Soviet cooperation in the conquest of space is a natural extension of the traditional fraternal relations between the Russian and Bulgarian peoples. Unquestionably, such relations will be strengthening and developing with every passing year.

5003
CSO: 2202/21

ADDITIONAL DETAILS ON TASKS OF 'INTERKOSMOS-BULGARIA 1300' SATELLITE

Sofia TEKHNICHESKO DELO in Bulgarian 15 Aug 81 pp 1,7

[Article by Senior Scientific Associate Candidate of Physical Sciences Engineer Stefan Chapkunov, director of the Interkosmos-Bulgaria 1300 Ionospheric-Magnetospheric Project: "The Ionospheric-Magnetospheric Project"]

[Text] A project is born like a person: there is an incubation period, pain and... happiness. "Bulgaria 1300 was the result of the growing space activities of the Central Laboratory for Space Research (TsLKI) of the Bulgarian Academy of Sciences: five different instruments for the study of space around the earth with the help of vertical heavy rockets and artificial satellites were developed in 1978 alone; ten such instruments and systems were developed in 1979 (!). Two of them were for use in outer space by the first Bulgarian cosmonaut.

TsLKI has long been involved with studies of the ionosphere. As early as 1961 its director, Corresponding Member Prof Kiril Serafimov, began to work on methods for the study of the electrified segment of the air. In the course of its decade of existence the TsLKI has developed as a specialist in direct sounding methods in the immediate outer space and has acquired the "monopoly" on the study of natural atmospheric optical emissions through direct instruments mounted on rockets and satellites. The ionospheric-magnetospheric project, which has been carried out through the Interkosmos-Bulgaria 1300 project, is a new qualitative stage in the development of our young space science. Its first significant accomplishment was the acknowledgement of Bulgaria as the 18th space country in the world, after the first Bulgarian instrument P-1, used for combined studies of structural plasma parameters around the satellite, was mounted on the Interkosmos-8 satellite, which was launched on 1 December 1972.

The project consists of 12 Bulgarian-made instruments and systems whose work and functions make possible total studies of the most important parameters and characteristics of the track followed by the Interkosmos-Bulgaria 1300 satellite.

The experiments planned for the active life of the satellite may be arbitrarily classified as follows:

Wave measurements, which include studies of the electrostatic field (including its low-frequency changes in the 20 hertz-20 kHz range) and definition of the vector of the constant magnetic field with a level of accuracy unattained previously in the Interkosmos program;

Structural plasma measurements. Electron and ion concentrations (local values) and temperatures are determined; the ion mass structure is partially defined and so is the drift of the ion plasma component;

Natural optical atmospheric emissions in the visible and ultraviolet areas of the spectrum;

Study of greatly accelerated electrified particles, such as electrons, protons and ions. The studies cover partial concentrations, energy spectrum and mass structure (of the accelerated ion component);

Geodetic and geophysical problems, which are resolved with the use of a passive laser "reflector" system mounted on the "arc" of the Interkosmos-Bulgaria 1300 project (developed by the Bulgarian Academy of Sciences Central Laboratory for Higher Geodesy, Prof Dr Nikolay Georgiev, director).

All of these experiments are mutually complementary and allow the comprehensive study of the environment in which the satellite is orbiting. It is indicative that similar problems were assigned to the American Dynamic Explorer Project, which is taking place through two satellites covering almost entirely the time of operations of the Interkosmos-Bulgaria 1300.

The readers of this newspaper will probably be interested to know some of the characteristics of the satellite on which Bulgarian scientific equipment is mounted. It is of the famous Meteor type. These satellites are specifically designed for meteorological observations. On the basis of a standard carrier, the Soviet designers have developed a technological research masterpiece which meets all modern requirements of experimental physicists. The satellite is entirely metal-plated, including the solar battery panels which, when spread, have an impressive size: 17 linear meters (!). This heavy satellite (weighing more than 1.5 tons!) is amazingly elegant and functional. It is equipped with numerous fixed deploying and telescopic rods which give it the aspect of a strange hedgehog. The satellite has an amazing level of stabilization along its three main axles.

The basic problem of complex satellites of the Interkosmos-Bulgaria 1300 type is the electromagnetic compatibility of the individual instruments and systems. Let me emphasize that in this case a specialized Soviet institute participated in the stage of the comprehensive tests conducted by the USSR Academy of Sciences Institute of Space Research and at the manufacturing plant, with a view to the objective assessment of electromagnetic compatibility. The compatibility proved to be incredibly good in this type of scientific space system.

Now, when the flight of the Interkosmos-Bulgaria 1300 satellite is a fact, we must express our sincere gratitude to the Central Committees of the BCP and the CPSU, which decided to implement the Bulgaria-1300 space program, which includes two satellites: one for ionospheric-magnetospheric studies and one for the study from outer space of natural resources, with the help of the Interkosmos-Bulgaria 1300 and the Meteor-Priroda satellite. The decision led to scientific and technical developments of a big Bulgarian-Soviet scientific and technical collective and to the implementation of the two Bulgarian projects as planned.

The main part of the Bulgaria-1300 program lies ahead: the reception, processing and interpretation of the scientific data supplied by the Bulgarian instruments and systems. Both satellites have a relatively long lifespan, which means several years of work on the results. The initial result, however, is already clear: in the course of these few years of dedicated work, a Bulgarian-Soviet scientific and technical collective was developed which, according to senior Soviet personnel, can resolve any problem related to outer space around the earth.

5003
CSO: 2202/22

NEW TECHNOLOGY FOR IMPLANTING METALS IN PLASTIC MATERIALS OUTLINES

Sofia ANTENI in Bulgarian 12 Aug 81 p 3

[Article by Georgi Georgiev: "Through Ion Implantation"]

[Text] For the First Time in the World

"Method for surface modification of synthetic, artificial and natural polymer compositions with metals, metalloids and gases." Authors: Scientific Associate Kol'o Kolev, Rosen Yankov, physicist; Scientific Associate Engineer Asen Dzhakov; Senior Scientific Associate and Candidate of Physical Sciences Blagoy Amov, Stoyan Stoyanov, from the Institute of Nuclear Research and Nuclear Power Engineering of the Bulgarian Academy of Sciences, and Senior Scientific Associate and Candidate of Chemical Sciences Lily Peeva, Institute for the Treatment of Plastics.

Last May this method took first place in the "Invention of the Month" competition. This is a guarantee that its scientific and economic contribution will be unquestionable. Few readers would have an idea of the nature of the invention from its name, for which reason we shall explain it:

It is a question of a modification (change) of the surface of substances, in the course of which they acquire new properties. A particular alloy is obtained through diffusion or introduction (implantation) of ions. The ion implantation method was discovered 20 years ago and in recent years studies have been focused on the interaction between accelerated ions and semiconductors and metals. This is being used ever more extensively in modern semiconductor microelectronics.

All of us know that plastics are used to replace metals and that in some cases they are not only as strong and elastic as metals but are even preferable because of their lighter weight and resistance to corrosion.

But could plastics become conductors and replace precious metals? Could our clothing be lined with a fine metal sheet? These strange questions were answered by a group of authors headed by Scientific Associate Kol'o Kolev.

"There are chemical means for metalizing plastics. However, regardless of how thick the cover is, it may peel off. Furthermore, the manufacturing processes are difficult to control and are inaccurate. How are ions of metals, metalloids and gases implanted in synthetic, artificial and natural compositions?"

"All that we need," said Rosen Yankov, a 30-year-old physicist, "is an ion-radiating system which will emit ions whose acceleration to the target will be controlled. In this case, the target is the object, the organic matter on whose surface we would like to develop entirely new qualities. The direction in which such qualities will change depends on the amount of energy, the chemical element whose ions are used and the type of polymer. The accelerated ions forcefully penetrate at a determined depth and a molecular alloy and a fine stratum with a thickness not exceeding a fraction of a micron is obtained. This surface remains virtually unaffected by mechanical influences such as crushing, folding, friction, or washing.... Unlike the use of chemical methods, there is no need to process the surface in advance and apply various binding lacquers. The method thus makes it possible to introduce a precisely dosed quantity of virtually any chemical element."

"It would be difficult as of now to indicate all industrial areas in which the Bulgarian method may be used. Nevertheless, ..."

Kol'o Kolev's answer:

"When Hertz discovered radio waves he had no idea of their future use or economic effect. It is difficult to determine the economic effect of our invention. On the basis of our studies we claim that it will be possible to develop fine metal conductor strata on plastics, surfaces with heat and light reflecting properties and special clothing. Metallized polymer surfaces will be used in medicine, construction, solar power engineering, household needs, microelectronics and the semiconductor industry. They will certainly be useful in other areas as well."

Naturally, not everyone can give advice as to how to make the best use of this contribution by Bulgarian scientists. However, there are interested departments in charge of proving practically and promptly that in this case this economic contribution will be unquestionable and promising.

5003
CSO: 2202/22

BRIEFS

HIGHER PLANT YIELD DISCOVERY--Scientists at the Institute of Microbiology, Czechoslovak Academy of Sciences (CSAV), have developed a remarkable method of increasing wheat and sugar beet yield. Based on so-called bacterization of seeds, this unique method has resulted from a study of interaction of phytopathogenic fungi and its accompanying bacteria. The process is based on topical application of selected bacteria cells on seeds, creating suitable conditions for their growth. The outcome is lower occurrence of root disease caused by phytopathogenic fungi, which consequently increases plant yield by 5 to 10 percent. The favorable effect of bacterization is supported by application of organic fertilizers and urea to the plants. The CSAV scientists and experts from the Experimental Institute of Plant Production have been involved in the next phase of the research aimed at practical application of this method. [Prague ZEMEDELSKE NOVINY in Czech 9 Oct 81 p 4]

CSO: 2402/3

ENHANCED NITROGEN FIXATION SOUGHT THROUGH GENETIC ENGINEERING

Budapest MAGYAR HIRLAP in Hungarian 27 Sep 81 p 11

[Summary] To overcome the costs and damage caused by growing use of synthetic nitrogen fertilizers, researchers are attempting to identify the genes or discover the mechanism which determines symbiotic nitrogen fixation. Hungarian scientists working at the Institute of Genetics of the Szeged Biological Center have already attained notable results in this work. Institute work is under the direction of Adam Kondorosi who describes it as follows:

"We investigated Rhizobium meliloti which has a symbiotic relationship with alfalfa. To obtain the genes we were seeking, we created through mutation forms incapable of symbiosis; this was how we identified the genes to be investigated. The next step was to locate in the chromasomes the genes somehow responsible for nitrogen fixation and whose properties had been damaged through mutation.

"We began this work in 1976 and succeeded in making the first genetic map of the rhizobium chromasome at the same time as a British and an American laboratory. We were the first in the world to do this in the case of the meliloti species. Also, in the case of this species of bacteria, we and other research groups arrived at the structure of certain genes through genetic engineering. We described the sequence of amino acids in the case of one of the proteins of the enzymes responsible for nitrogen reduction; we succeeded in isolating some genes which encode nitrogen fixation, the formation of nodes. Results indicate that most of these genes are located on a plasmide of a separate DNA molecule rather than on the chromasome of the bacterium. In any event, this piece of DNA which is outside the chromasome or rather its gene can be transferred from one rhizobium to another and thereby create hybrids capable of symbiosis with other plants. This was first achieved by a British laboratory. We, too, prepare such improved forms.

"Our work is supported by the Protein Program Office of the National Technical Development Committee. A research association has been formed with the cooperation of several institutions interested in this theme. Its purpose is to provide the farms with more effective rhizobium innoculating material.

"Within the next year or two we, in Hungary, will probably be able to combine properties useful in nitrogen fixation in a hybrid rhizobium. Through our own and foreign research we will acquire theoretical knowledge which will enable us to state how nitrogen fixing genes can be transferred to papilionaceous plants in such a way that they will be accepted, also to learn which plants will accept them."

CSO: 2502/1

MICROELECTRONICS FACING UNCERTAIN FUTURE IN HUNGARY

Budapest FIGYELO in Hungarian 30 Sep 81 p 9

[Excerpts] The propagation of microelectronics has been characterized by indecisiveness and inaction in Hungary and this threatens the country's economic-technical standards. In the following discussion the uncertainty of future microelectronics is revealed through the views of two specialists: Ferenc Banyai, managing director of the Communications Engineering Industrial Research Institute [HIKI], and Gyula Boglar, department head of the Development Institute of the Telephone Factory.

Concerning the supply of microelectronic items, Banyai says, "Speaking charitably, we can say that parts production has attained the technical level of 1965. Yet the extent of the lag is hard to measure since some places boast quite modern equipment. Yet a complete, operation-ready production line exists nowhere in the country. Although HIKI, for example, spent 400 million forints on investments in this field, it lacks production equipment which is uniform in capacity and technical standards. The same lack of uniformity holds true for the Institute's specialists. All this leaves out of consideration the lack of the type of infrastructure required by the technology of active element production: very pure water, oxygen, nitrogen, even temperature, ventillation. Practically all the requirements for making microelectronic parts are unmet.

"Let us not forget that achievements in this field have resulted from the orders placed by the armed forces throughout the world. Thus pilot plant production and testing are overtly or covertly subsidized. This has not happened in our country. To this day the industry has not received investment and development opportunities on which it could build."

According to Boglar, branches of industry other than microelectronics enjoyed priority in the former Ministry of Metallurgy and Machine Industry. No central development program was set up for microelectronics. "Lack of development in this field threatens the international competitiveness of our electronics industry the production value of which now amounts to an annual several 10 billion forints."

"Lack of a unified concept," Banyai resumes, "has led to a peculiar distribution of roles: HIKI fabricates hybrid circuits at virtually industrial level on a production line suited mainly for pilot plant production. Production is naturally quite costly, but even so we cannot meet domestic demand. We prefer to produce circuits designed to order rather than make so-called 'basic' circuits. Yet, as the Telephone Factory representative can confirm, even the former can be obtained more cheaply from abroad."

Boglar agrees with this, stating that his factory now buys from Great Britain. Banyai adds that in many cases HIKI produced [circuits?] instead of the Remix Radio Engineering Enterprise. He then states: "As a result of concerted action by the Associations of Communications, Automation and Transport, there is now a program office, an inter-portfolio committee and a government committee on microelectronics. A decision is being formulated. However, it is 15 years late. Even with a go-ahead decision, it will be 1985-1986 before there can be any production."

In response to a question concerning the main current trends in view of previous results, Boglar replied: "As a user, I am against mass production of parts. Professional installations bring a better price on the world market. Parts should be purchased abroad. Fabrication of circuitry destined for incorporation in installations is preferable. We must aim to make installations which are smaller, less energy demanding and more reliable."

Speaking from the viewpoint of HIKI, Banyai says, "I feel that if we succeed in acquiring a smooth-running production line operating with MOS technology and having an annual capacity of 40,000 chips, we will be able to produce an industrial level and meet rapidly growing domestic demand for installation-oriented circuits provided that suitable circuitry planning systems exist."

When asked whether, granted the need to use microelectronics in domestic investments and in production of installations, it was essential for Hungary to make parts rather than buy them elsewhere in Europe, Banyai replied: "This is a great dilemma. To this should be added that all the socialist countries, ranging from the GDR to Bulgaria, have implemented tremendous investments in this field. Furthermore, total imports of such items from capitalist countries amount to no more than 18 million-20 million dollars a year. This is not such a vast figure. However, market experience teaches us that, due partly to the embargo and to current shortcomings in CEMA cooperation, we cannot rely completely on imports. If we wish to buy from CEMA, we must be ready to offer to export something in return because of the bilaterialism in the subbranch. In the eyes of the bank, we are not competitive. Yet the competitiveness of Hungarian industry and its ability to deliver depend largely on this: If we are unable to incorporate microelectronics into our products, they will sell neither in the East nor the West."

CSO: 2502/3

HUNGARY

BRIEFS

IONIZING RADIATION MEASURING DEVICE--Calibration of dosimetering instruments used in practice is performed by measuring them against secondary etalons derived from the national etalon. Jozsef Hizo, department head of the National Scaling Office, has invented a device for measuring ionizing radiation. The device improves accuracy and broaden the range of measurement. Quantities which require measurement differ widely by as much as eight orders of magnitude. The secondary etalons derived for this purpose consist of an ionizing chamber in which electric current is generated by radiation. This can be measured only by an extremely sensitive meter: current having a strength of 10^{-12} amperes must be measured to an accuracy of a tenth of a percent. Hizo's researches, conducted in the field of applied physics led to development of the ionizing chamber. The chamber had to be capable of measuring radiation doses of varying intensity with equal accuracy. It was important for the chamber not to be extremely energy dependent, to be stable and capable of measuring small doses such as are important in environmental protection. The new ionzing chambers have been fabricated in a variety of sizes: 0.3, 40 and 1,400 milliliters. A 10,000-milliliter version is now being prepared. A large Austrian semi-government research institute has purchased the right to use the patent and develop it. There have even been talks about joint fabrication and sales. The invention has been patented and talks are under way concerning patents in Austria, the U.S.A. and the Common Market countries. [Budapest NEPSZABADSAG in Hungarian 15 Sep 81 p 8]

CSO: 2502/2

SCIENTIFIC-TECHNICAL CONGRESS STRESSES ITS CONSULTANT ROLE

Warsaw TRYBUNA LUDU in Polish 18 Sep 81 p 4

[Interview with Bogdan Kumat, secretary general of the Chief Technical Organization (NOT), by Andrezej Konieczny; date and place not specified]

[Text] [Question] How many engineers are there in Poland, and what is the percentage of members in scientific-technical associations?

[Answer] The Federation of Scientific-Technical Associations within the Chief Technical Organization (NOT) has over 550,000 members. There are over 200,000 engineers in the federation. However, this constitutes only about 50 percent of all engineers in the national economy.

[Question] Do you not think that genuine activation of this intellectual potential could contribute to bringing the economy out of this crisis more quickly and effectively than is shown in the boldest prognoses? After all, the resourcefulness of Polish engineers is well known, and it is therefore laughable that problems like a lack of gaskets and spare parts should exist, along with frequent breakdowns in entire plants and industrial branches.

[Answer] Of course. They testify to the hitherto existing achievements of the engineering and technical community in technical progress, which exerts an influence on the ultimate results of economic activity. Widely known are the names of Polish engineers who have written themselves forever in the history of economic development in our country.

Let's Organize Anti-Crisis Committees at Our Plants

We are also currently aware of the large role required to bring the economy out of this crisis, as well as to remedy and stabilize it. This is why we must be very active in our community, especially in the plants where the primary goal is to correct the supply of raw materials and energy, along with maximal utilization of production strength.

Above all, we have instructed all scientific-technical associations and our sections and committees to undertake crisis action. We would like each plant to have an anti-crisis committee that would be able to work out programs to take advantage of every resource at an enterprise's disposal. This concerns not only raw material resources, lasting measures and so on, but also taking advantage of the knowledge and experiences of engineers and technicians belonging to scientific-technical associations (SNT).

[Question] What conditions cause this authentic activation within the community of Polish engineers and technicians? Why has this not happened previously?

[Answer] The widely understood activation of engineers and technicians is dependent above all on the right choice for guiding the development of the Polish economy, which is closely tied to acceptance of the most favorable variable for economic reform. We have worked out and shown the state authorities the opinion and position of engineers and technicians regarding this issue. Our community is now awaiting some quick decisions. Prolonged work on the final shape of reform was one of the reasons for less than rapid joining by the engineering and technical community in the activity designed to get the economy out of this difficult situation. The fact is that many of our proposals were lost. This is the source of disbelief that we have to conquer.

Credibility of Work

[Question] What does NOT aim to do to bring about this activation? Will NOT's authority in this aim be credible to the membership of SNT?

[Answer] We wish to base the community's activation on the credibility of action by the entire federation. It will depend primarily on the independence and efficiency of actions. We must achieve a situation whereby specialists from SNT will prepare projects, reports and opinions that will be utilized in full during important economic decision-making. We feel that we should obtain the role of public consultant as regards the proper directions for the development of Polish technology. We have at our disposal an enormous pool of specialists with the highest qualifications in various fields. This is why we are able to take on such a task.

I also can assure you that material worked out by us will be completely objective and in accordance with the spirit of independence, which the membership of SNT has so strongly stipulated.

[Question] What are NOT's relations with "Solidarity"?

[Answer] The federation of SNT and NOT views cooperation with the independent trade union (NSZZ) "Solidarity" as paramount. There are many fields in which such cooperation is particularly desirable. We should cooperate in the matter of developing individual industrial branches and plants, and also in taking advantage of scientific-technical associations at the plants. This concerns primarily cooperation which deals with technical corrections in working conditions for personnel, their social and living situation and so forth.

The proposal for cooperation has already been sent to "Solidarity's" National Consultative Commission (KKP). I think there will be shortly a meeting with representatives from "Solidarity" on this matter. We also have invited representatives from "Solidarity's" KKP to participate in the Organizational Committee for the Eighth Congress of Polish Technicians.

[Question] How do you see the role of your associates in the new autonomous organs?

Expert Assistance for Autonomous Organs

[Answer] SNT and NOT should be above all an advisor to labor autonomous organs in resolving numerous problems with which the plants struggle, especially in the area of rational actions by the enterprises. I think that the expert opinions of experienced engineers and technicians will be utilized to establish programs and production tasks for plants. Some associations already have declared themselves to be labor autonomous organs, counting that this initiative will meet with full recognition.

[Question] How is the upcoming Congress of Polish Technicians supposed to be different--and it should be--from previous congresses?

[Answer] Congresses of Polish Technicians have a long tradition. Important and meaningful opinions as regards the directions of economic development in Poland frequently have been established at them. However, not every congress played such a role. There were also some congresses that limited themsleves to defining the means by which to implement previously established directions for economic and industrial development. Of course, they did not fulfill the broad expectations of our members, which caused widespread disenchantment.

We hope that the Eighth Congress of Polish Technicians, which will take place 6-8 November 1981 in Lodz, will link itself to the best traditions of preceding congresses. We aim, besides passing concrete and realistic resolutions, to fulfill the fundamental expectations of all members of SNT, who count on compliance with their opinions and positions dealing with various fields of life in Poland.

The Congress's resolutions should become the creative material for those persons who will make the basic decisions about the development of the Polish economy.

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USE OF MODELLING TECHNIQUES TO SOLVE PRODUCTION PROBLEMS

Tirana ZERI I POPULLIT in Albanian 27 Sep 81 p 3

[Article: "Modelling and Some Production Problems" by Pandi Stratoberdha, director of the Laboratory for Hydraulic Research in the Academy of Sciences and Robert Progri, teacher in the Faculty of Engineering in Tirana University]

[Excerpts] Modellings in the fields of mathematics and physics have been used in Albania to find a solution to theoretical and practical problems posed by life. The partial studies executed some years ago in the "Josif Pashko" combine on thin corrugated coverings, in the Faculty of Geology on geological strata and, especially, on the enrichment of ores, in the department of inorganic chemistry of the University of Tirana on the enrichment of phosphates and other projects have paved the way for the use of these scientific methods in production and construction on a broad scale.

The great progress which Albania has made in the field of hydroenergetics has been preceded by a rapid development of hydraulic modelling activity. The Laboratory for Hydraulic Research of Tirana University, which now belongs to the Academy of Sciences, was set up in Tirana in 1969. In this laboratory, which is equipped with modern apparatus, mathematical hydraulic modelling and physical hydraulic modelling are carried out. This laboratory has contributed not only by successfully executing a number of concrete duties but also by serving as a marvelous unit for raising the scientific content and level of teaching in the discipline of hydraulics in the Faculty of Engineering.

During a period of 10 years, a number of positive studies were completed in the field of hydraulics, such as those related to the hydroelectric power plants in Vaui Dejes, Fierze, and Koman and Bushat, which are in the planning stage. In addition, a number of agricultural hydrotechnical projects were studied, such as the above-ground and underground hydraulic problems of the Cengelaj, Vlashuku, Ndroqi, and Zaranika dams and of Lumar Dam No 1.

Last year, this laboratory was concerned with the hydraulic modelling of the "Light of the Party" hydroelectric power plant in Fierze and with the problems of the hydraulic system used in the operation of this plant. Today it is also concerned with hydraulic problems related to the Koman hydroelectric power plant and the Bushat plant, the problems of tides in the ports, the problems involved in entering the port of Vlore and other important hydraulic problems. Today there are two small nucleuses of hydraulic modelling which are studying the dynamics of the underground movement of fluids. These two nucleuses have collaborated to solve important problems related to petroleum and they provide a good example. Some studies in the area of mathematical modelling, in collaboration with the petroleum extraction sector in Fier (related to the underground problems of petroleum and aiming at the best possible use of resources) have been interesting. Nevertheless, the Hydraulic Research Laboratory should give more assistance to the other study nucleuses.

In addition to the good and important work which is being done by the centers for computer mathematics. specialized mathematical and physical models are being created in the various laboratproes and departments of the university, in the production enterprises, in construction in mechanics and in agriculture. From day to day, these models are enlarged and improved in order to better serve the building of socialism.

The resolutions of the 8th plenum of the AWP Central Committee have assigned great duties to agriculture, the extration and processing industry, the building industry and the machine industry, and, in particular, to the machine producing industry, both in regard to technology and in regard to construction. The future projects, which we will construct solely through our own forces, will require construction modelling in addition to technological modelling. In the future, these modellings will have to be expanded because they are related to the best possible construction solutions, savings in raw materials, improvements in technology and the raising of the level of mechanization of the work processes. An important role in this regard would be played by an experimental research center studying the problems of the solidity and the static and dynamic resistance of mechanical constructions and of construction. We think that the time has come to set up such a center through cooperation among the Faculty of Engineering of the University of Tirana, and the ministries of construction and industry and the Academy of Sciences. We are raising this issue because a good part of the equipment can be found in the country and there is no lack of specialists with up-to-date experience. We think that, in the beginning, studies could be made of the Mifoli railroad bridge, the reinforced concrete screen of the dam of the Koman hydroelectric power plant and other projects.

We think that the Committee for Science and Technology should play a more active role in the intensive development of modelling activity, by organizing and coordinating all scientific work in the country which is assigned to it, in cooperation with the Ministry of Education, with the other ministries and with the executive committees, so as to make modelling a scientific means in the hands of specialists in the whole country.

CSO: 2102/1

ACTIVITIES, EQUIPMENT AT ROZHEN OBSERVATORY DESCRIBED

Sofia SLAVYANI in Bulgarian 8 Sep 81 pp 69, 71

[Article by Mariya Baeva: "When the Skies Over Rozhen Are Starry"]

[Text] The National Astronomical Observatory of the Bulgarian Academy of Sciences is a small "starry" town. It is located high in the Rodopi Mountains, at an altitude of 1,750 meters. Here a 30-meter high dome raises impressively above work and residential premises. From it a telescope with a mirror 2 meters in diameter is turned to the stars.

The National Astronomical Observatory is very young: It was inaugurated at the beginning of 1981. However, its prehistory is long. BAN [Bulgarian Academy of Sciences] specialists made a thorough study of international experience in the building of such installations for 20 years. They looked for a suitable place for the Bulgarian observatory and developed new ideas in the course of such comprehensive activities. The specialists' attention was drawn to the Rozhen site. Here the number of clear nights is greater, the air is the cleanest, the elevation is sufficient and the topography and distance from settlements eliminate undesirable light radiation. The Bulgarian scientists included in the observatory the achievements of institutes, plants and specialists from the GDR, Hungary, the USSR, the United States, Great Britain, Austria and other countries. The result of these efforts is a sensitive, accurate and perfectly interacting system of modern optics, mechanics and electronics for obtaining information from the starry skies.

Today Rozhen observatory is the biggest in Southeastern Europe. Many of its features make it unique in the socialist countries. The two-meter Ritchie-Chretien telescope, fully automated, equipped with electronic technology, is the most modern big instrument ever produced at the Karl Zeiss works in Jena, GDR. Even countries such as Italy, France, the FRG and others have no such telescopes. The observatory also has a 60-centimeter telescope and a 70-centimeter Schmidt camera.

Actually, Bulgarian interest in astronomy, a science containing a pure desire for knowledge, is centuries old. The ancient Bulgarians had an astronomical calendar and the written records of the 1,300-years old Bulgarian state contain frequent references to astronomical observations and records of remarkable celestial phenomena. After 1944, Bulgaria offered extensive opportunities for the development of national observatories and planetariums. Small observatories were built, such as the one in Belogradchik (a 60-centimeter telescope) and in Stara Zagora. Stations for watching artificial satellites were set up. The building of the National Astronomical Observatory is a major step in the development of Bulgarian astronomy.

I asked Dr Bogomil Kovachev, deputy director of the autonomous astronomy section and scientific manager of the observatory what were the tasks of the observatory.

"The problems covered by our scientific research covers some basic directions in the observation and study of stars and star clusters, galaxies and extragalactic objects, bodies in the solar system and other light-radiating objects. From Rozhen we can observe objects billions of light years away. The observatory has already obtained many plates, spectrograms and records of a number of interesting objects. We have identified 14 nova. More specifically, in the area of astrophysics, for example, spectral studies are being conducted of twin stars, magnetic stars, early and supergiants, hot stars with emission lines in the spectrum, and others. Work in this area will be based on an increasing number of comprehensive programs which will include observations conducted by other major astronomical observatories, involving the participation of leading institutes and scientists, on the basis of multilateral and bilateral scientific cooperation."

This entire complex and interesting work is being done by about 40 young specialists -- astronomers, physicists, mathematicians, engineers and technicians. They live with their families in comfortable housing facilities next to the observatory, and their working "day" begins when the sky above Rozhen is starry....

5003
CSO: 2202/1

COMPUTER SPECIALISTS DISCUSS PROGRESS, PROBLEMS

Sofia TRUD in Bulgarian 9 Sep 81 p 3

[Article by Engineer Ivan Ibrishimov: "Four Is the Lucky Number!..."]

[Text] We live in an age in which every one understands that there is no area of the country's economic life which can develop without the help of computers!....

Lines From the "Biography" of the Computers

The requirements facing computers have changed a great deal of the principles governing their manufacturing and use. Each type of economic activity has its characteristic features which require specific ways and means for the presentation and retrieval of information. This has led to the creation of dozens of different machines operating on the basis of different principles. Their mass utilization caused the problem of their universal use, interchangeability and interaction. The solution was found in the creation of computers.

The idea is that machines must consist of several units which may be combined according to needs and purposes. This is the nature of the "ES" computers adopted by CEMA (our major computer centers are equipped with modified models of such computers). Their main part is a central processor -- a system which provides the main control and data processing. Obviously, the creation and installation of such processors are among the most complex problems facing computer designers....

The Facts

The State Committee for Science and Technology presented awards to engineers Georgi Rachev, Khristina Aleksandrova, Violeta Furnadzhieva and Maksim Dimitrov, from the Computers Plant (ZIT) in Sofia for the application of the ES 2635 central processor. Why did they deserve this award?

The ES 2635 central processor is the offspring of the cooperation between the Minsk and Sofia computer institutes. It is the brain of the entire 1035 system, which includes a number of Bulgarian instruments. Series production was started in Minsk in 1979, while four Bulgarian engineers began to work on its application. In under 6 months, working night and day, in three shifts, they did a tremendous amount of rather complex work. Thus, at the cost of incredible efforts, the loss of time caused by a variety of difficulties was largely recovered.....

The People

Their average age is 30. They may have graduated from universities at different times, but are unanimous on one subject: plant practice is their great teacher. One of them, G. Rachev, is currently working at the IIT [Computers Institute], while the others have stayed with the ZIT design department. Before I meet them, I asked Engineer Todor Yonchev, the head of the department:"What was the main problem which was resolved with the help of the processor?"

"At that time we had no sufficient personnel so that we could send them to Minsk, to see the finished system on the spot. Within an exceptionally short time the four applied the processor on the basis of documentation only."

On the basis of documentation only....For a person unfamiliar with such problems this may not mean a great deal. It would be difficult even to explain how seemingly petty matters could hinder the work! Furthermore,there is virtually no case for blueprints not to have some errors or omissions. How can they be detected if there is no basis for comparison, and when, in order to go on, one needs not only knowledge and skill but intuition also? It is at such times that the individual qualities of the specialist-innovator become apparent.

Engineer M. Dimitrov: This was my first machine! I owe to it many of the things I now know. I simply did not believe that we will be successful!

Engineer Kh. Aleksandrova: It so happened that we had to do everything ourselves. Our colleagues at the IIT were quite busy with other tasks and could not help us. It order to meet the deadline we decided to work in three shifts, uninterruptedly.

Along with the application of the system, they made a number of improvements to it. The delicate operation was then taken over by the tuning shop.

Engineer V. Furnadzhieva: Compared to the application of the previous model of 1972, the difficulties involved in the application of the ES 1035 were greater. They were caused by the advantages of the new system with its double command accuracy, big memory, possibility of easy and quick correction of errors and expanded microdiagnosis. This means that the operator receives instantly precise information on any existing defect and can eliminate it quickly.

At this point, rather than enter a new area, we turn our sights to the future of the ES 1035 system. It has been in production for some time, and thanks to its universal advantages, it will be gradually replacing the current ES 1020 and ES 1022 models at the territorial computer centers. It is already being used by the Committee For Unified Social Information and by a Hungarian institute. Its qualities have placed it quite high in the hierarchy of similar systems. On its basis the IIT developed a purely Bulgarian model with even greater advantages (it is good that the main machines and assemblies are being produced in our country).

The ES 1035 will help thousands of specialists in all fields. They will welcome it as a new good machine. To those who applied it it represents something far more personal, like the figure "four," which perhaps symbolizes a very great success in innovative work!....

5003
CSO: 2202/1

REGULAR PRODUCTION OF NEW PHOTORESISTORS IN PROGRESS

Sofia VECHERNI NOVINI in Bulgarian 12 Sep 81 p 6

[Article: "Bulgarian Photoresistors: Timely Introduction of an Achievement of Our Academic Science" by Corresponding Member Professor Milko Borisov, Professor Stefan Kunev, directors of development and introduction. Candidate of Physical Sciences E. Kabasanova, Candidate of Physical Sciences R. Kakanakov, chief executors of development and introduction.]

[Text] Since July this year, the United Plants for Memory Devices (OZZU) in Plovdiv has begun the regular production of low inert photoresistors of cadmium sulfide with differential output (FRD). They are used to regulate the rewinding tension and control of magnetic tapes in memory devices, as well as to meet other needs in photoelectric automation.

This new electronic device is being developed and introduced by the Central Laboratory for Solar and Other Energy Sourses (TsLSENEI) at the Consolidated Center for physics of BAN (Bulgarian Academy of Sciences) on a contract with OZZU in Plovdiv. The basic stages in the contract were fulfilled in a year and a half.

The technology of the material for our FRD is original. It is protected by two authors' certificates for inventions. The assignment for the development of FRD was based on the parameters of the differential photoresistors manufactured by the American firm CLAREX, which were used until the present in the product CM 5300 of OZZU in Plovdiv, and upon whose import into our country an embargo was imposed. Our FRD, in comparison with the American one, is faster (its inertia is smaller than 5 milliseconds). In the present reliability experiments, which were carried for more than 3,000 hours, no failures or signs of aging were observed.

In comparison with the differential photoresistors of the type FSK-7a and FSK-7b manufactured in the USSR, our FRD's have six times higher a rate of changing their electric resistance when exposed to light. This rate is over a thousand, and in some samples it reaches hundreds of thousands. Their inertia is thirteen times smaller, and the electric current asymmetry is five times smaller. At 20 percent output, it is 20 percent, and it can be brought down to 0 percent if the output is not taken into consideration. In addition, our FRD's are two times lighter.

The production line for our FRD in OZZU in Plovdiv was made entirely in our country to designers' orders, without purchasing ready-made standard equipment. Now, with the expansion of the production, it is being doubled and perfected in order to achieve fuller automation of the technological processes and a lower cost of the product. Presently, a metal-glass basis with an optical window is used in manufacturing FRD's. A plastic case is being developed, which is expected to lower considerably the price of the product in the future. In our country, the department for semiconductor technology and electronic materials at the higher Chemical and Technical Institute in Sofia developed and now supplies suitable initial material for the needs of this production.

In the laboratory for applied physics at ETsF (Consolidated Center for Physics) at Ban, a production section is being organized which, in the future, will begin the production of other cadmium sulfide and cadmium selenide for the needs of the photoelectric automation in our country. Annually, more than 100,000 photoresistors like these are imported for this purpose. The high quality of the Bulgarian photo-resistors makes them not only sufficient for our needs, but also competitive for export.

The good results of this development and its introduction were made possible mainly by the systematic, fundamental research in the field of photoelectric phenomena and the properties of wide-zone semiconductors, which, as an old tradition in our country, has been conducted for a long time. As it was noted in the published report of the State Planning Commission: thanks to this research, the production of photoresistors of monocrystal cadmium sulphyl was mastered as early as 1961. This production, however, could not be established at home or abroad because of insufficient technology. Later, a simple and inexpensive technology developed in our country allowed the production of sinterized material (baked under pressure powder) cadmium selenide or their mixture, with very good photoelectric properties, reaching those of monocrystals. It was shown too that alpha dichrome trioxide, used as an admixture in making this material, considerably lowers the inertia and aging of the photoresistors made by it. The influence of the dichrome exide upon the properties of recrystalized tablets was studied in detail in several scientific works which later served as a basis for a candidate's dissertation. Now, similar studies are continuing on thin layers of these semiconductor materials recrystalized through evaporation on ceramic and quartz tablets.

The comprehensive resolution of all problems related to the development and manufacturing of this new product is due to the creative cooperation between the above mentioned laboratories in Sofia and Plovdiv, as well as the department of semiconductor materials and electronic elements at the Chemical and Technical Institute in Sofia. Optical Mechanical Plant in Panagyurishte and others. The scientific team received invaluable help from the Okrug party committee in Plovdiv and the administration of United Plants for Memory Devices in the successful implementation of a Bulgarian invention.

9804
CSO: 2202/2

WOOD INDUSTRY USING ECONOMETRIC METHODS FOR MARKETING

Bucharest INDUSTRIA LEMNULUI in Romanian No 2, Apr-Jun 81 pp 97-101

[Article by Dr D. Patriche, economist P. Ghica and mathematician I. Ghica]

[Text] The broad process of development of the modern Romanian society through the goals being sought--providing a high growth rate for the national economy, social product and national income, achieving an appropriate balance between various branches and sectors of activity, more sensible placement of the production forces on the territory, more and more powerful flourishing of science, education and culture, improvement of all social relations, deepening of socialist democracy, more and more active participation of the broad masses of workers in the leadership of the units in which they work and of all social-economic life and full assertion of the human personality[1]--increases more and more the role and importance of scientific activity, placing tasks of great responsibility before the researchers. Both the researchers as well as specialists in various areas are being called on to continually broaden the area of science in order to contribute to speeding up the multilateral progress of socialist Romania.

In this context, economic research has special tasks and must contribute substantially to improving the way that objective economic laws are used conscientiously in the practical activity of the leadership and organization of social-economic life.[2]

The study of various problems of the growth in social labor productivity, superior utilization of raw materials and energy, reduction in consumption, intensive utilization of fixed assets, rise in economic efficiency and the profitability of production, particularly continued improvement in the economic-financial mechanism involve broad-scale use of progressive methods and forms of analysis and of making economic phenomena measurable.

An important contribution in this regard can be made by incorporating guidelines and methods which are well known in modern economic practice, called marketing, into the process of organizing the leadership of economic activities.

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1. "Directives of the 12th Party Congress on the Social-Economic Development of Romania in the 1981-1985 Five-Year Plan and Future Guidelines up to 1990," Political Publishers, Bucharest, 1979.

2. "Program-Directive for Scientific Research, Technological Development and Introduction of Technical Progress in the 1981-1990 Period and Main Directions up to the Year 2000," Political Publishers, Bucharest, 1979.

Marketing, which appeared from the need to solve a number of problems connected with the rational organization of the enterprise's resources, with a view to satisfying the requirements of life under conditions of maximum economic and social efficiency, treats a complex series of problems, oriented in particular toward explaining the main aspects connected with the enterprises' market policy.

An objective approach to the marketing concept in our socialist economy accompanied in its practical application by a number of well-thought-out measures can represent an important lever for improving economic activity and for satisfying consumption needs, for orienting demand in agreement with the general interests of raising society's level of civilization and optimum utilization of the resources of the national economy.

Marketing, developed within an enterprise or industrial central, concerns all their activities, contributing to a programmed mobilization of their forces. It has in mind, in the end, the organization of all the activities contributing to achieving efficient production, in accordance with the users' requirements, on scientific bases. This makes it necessary for any economic unit which adopts a market orientation in its activity to plan its marketing activities, regardless of the horizon of anticipation to which it refers, an action carried out in marketing programs.*

Marketing activity, however, does not conclude once the marketing programs are carried out, but it continues with the application, checking and periodic review of the programs established.

In this context, the application of marketing programsmeans a detailed laying out of tasks and establishing of terms for each of them, correlated in such a way as to insure the necessary continuity throughout the series of operations comprising the program. A special role also belongs to the checking which through its permanent nature seeks to carry out the actions forecast on schedule and to bring out the appearance of any new situations caused by unforeseen aspects. Checking within the marketing programs must be conceived so that it permits a periodic review of their content in order to be able to be adapted continually to new circumstances.

World economic practice in this area has outlined a number of econometric methods which offer both the opportunity for a detailing of the programs as well as for carrying out a strict check at all stages of achievement. Among them, the method of the critical line and the PERT system (Program Evolution Research Task) [sic; should be Program Evaluation and Review Technique] enjoys special attention, with both based on the theory of graphs. It also should be mentioned that both methods are based on the same principles, with the single difference being that the first operates with known lengths of time while the second operates with aleatory lengths of time. The usefulness of the two methods lies in the fact that their application insures order for the activity and discipline and efficiency in fulfilling the marketing programs.

The most important but also the most difficult part of establishing the mathematical model based on the two methods is represented by establishing the graph for the program, that is, the part of the study actually appeals to the search for order.

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* D. Patriche: "Marketing Industrial," Technical Publishers, Bucharest, 1977.

This is because the entire marketing program, according to these methods, must be represented by a graph, with whose help the criticalline is then determined. Under the conditions where the lengths of time are known, the critical line is calculated on the graph, obtaining the time it takes to carry out all the work, the intervals of variation and the so-called operational margins.

Proceeding from the fact that the marketing program represents a great number of operations which lead to fulfillment of a goal, the method of the critical line changes it into a graph of order, where the arcs represent the operations while the peaks represent the events. In case this method is applied, the lengths of time for the operations being known, becoming operational times, take certain values attached to the graph's arcs. In order to determine the graph it also is necessary to know the succession of events. Toward this end one proceeds to draw up a list of operations which then is subdivided into the function of the desired precision. The process of shaping then continues with a working analysis, the most important and often the most laborious part, an analysis whose purpose is to determine the antecedents of each operation.

In the marketing programs, their formalized structure represents the actual list of operations with their duration, which means that notation of the events can be made by E_i, where i takes the values from the large number of natural numerals in ascending order. The duration of each element is noted with di, being known and expressed in units of time, while the antecedents are established through the immediately preceding activities. Under these conditions, representation of the CPM network through the graph is carried out easily on the basis of the tabular methods which are at the basis of substantiating any graph. On the basis of these methods the calculation of the algorithms also is provided, all the complete lines are identified at the beginning from the network and then the duration of each line is calculated. The road of maximum value, within the network, is the critical line. The operations situated on the critical line represent the critical events, with the remainder of the operations becoming noncritical events.

The method of the critical line bears in mind that two terms are calculated on the basis of the CPM network for each event (i or j): the minimum term of the event (the term closest to carrying out the activity); the maximum term of the event (the term furthest admissible for carrying out the activity).

The particular terms may be determined on the basis of many procedures. The practical algorithm, through its simplicity and flexibility, draws our attention in the case of graphs without circuits.* According to this procedure, the levels of the graph are determined at the beginning, then x1 is considered a variable, representing an element of level (2); x_n, a variable representing an element of the level (n). If the graph has N + 1 levels, with the determinants proceeding from the origin of x_0, then x_0 is taken as the element of level (0) and x_n as the element of the level (N), calculating in succession:

$$V_1(x_1) = \text{max. } v_{01}(x_0x1) - v_{01}(x_0x_1)$$

$$V_2(x_2) = \text{max. } [[\underset{x_1}{\text{MAX}}[v1(x_1) + v_{12}(x_1x2)],[v_{02}(x_0x_2)]\ ]]$$

$$V_3(x_3) = \text{max.}[[\ \underset{x_2}{\text{MAX}}[v_2(x_2) = v_{23}(x_2x_3)],\ \text{MAX}[v_1(x_1)+ v_{13}(x_1x_3)],\ [v_{03}(x_0x_3)]\ ]]$$

where V_{ij} (x_1, x_j) represents the value attached to the arc (x_1, x_j).

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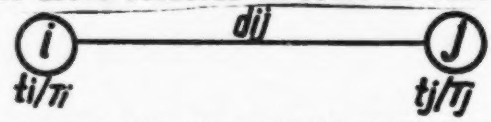
* A. Kaufman, G. Desbazeille, "The Method of the Critical Line," Technical Publishers, 1971.

MAX is replaced by max and MIN by min in the above formulas in order to find the minimum. The reserves are then determined.

Figure 1:



The total reserve* ($R_t = T_j - t_i - d_{ij}$) represents the time within which limit one can prolong the duration of the activity, without changing the critical line and, thus, the final term for the job, in the hypothesis that the preceding activities begin on time and those which follow end within the maximum terms.

The free reserve ($R_l = t_j - t_i - d_{ij}$) establishes a dependence between the noncritical activities, since the size of the duration of an activity by more than is necessary will delay the minimum term for beginning the following activity and, thus, will reduce the free reserve of that activity.

The intermediary reserve ($R_i = T_j - T_i - d_{ij}$), which represents the maximum interval of time by which the duration of an activity may be increased without changing the minimum term for beginning the next activity, supposing that the particular activity starts within the maximum term of its preceding phase.

Proceeding from this method for determining the algorithms, the Gantt graph may be drawn up; it finds the entire series for carrying out the jobs included in a marketing program.

With a view to testing and validating their practical usefulness, the particular methods have been used in coordinating the second marketing program within the Pipera Combine for the Industrializiation of Wood, with both offering revealing elements for specialists in outlining problems. In this material we are presenting several of the aspects offered by using the method of the critical line in checking on the flow of a marketing program for launching the Silva variety of furniture on the market.

With a view to launching the particular product, a marketing program was drawn up which by including the entire series of activities, both in the area of production as well as sales, sought to provide an efficient correlation with a view to achieving the goal sought.

The structure of the program was as follows:

The market study which had in mind establishing the strategic goals, collecting and processing the data and making the decision.

Creative activity: the designing of many products, the product analysis (selecting the most competitive version of the design).

Production activity, including: establishing the working operation line, organizing work, supply, building of the product.

Promotional activity: establishing the publicity message, selecting the publicity media, launching the publicity campaign, following up on the effects of the publicity.

Commercial activity: establishing the distribution channels, establishing the need by categories, training personnel in the sales units, supplying the units, actually commercializing the product, analyzing the sales.

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* The notations are the ones in Figure 1.

The technical-economic analysis: following up on the product's behavior with the consumer, watching the following of the product, economic analysis, new market studies, making the decision depending on the new conditions.

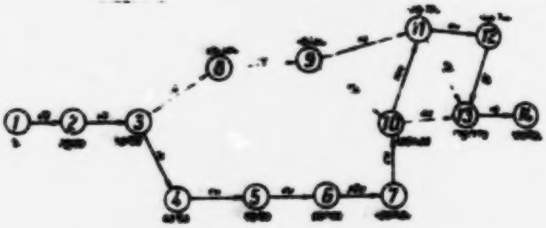
Proceeding from the particular program a list of operations was drawn up and a working analysis, as seen in Table 1, was made.

Table 1: List of Operations and Working Analysis

Activity	Event, start and finish	Description	Length of activity in days	Immediately preceding activity
1	2	3	4	5
A	1-2	Market studies	20	--
B	2-3	Creative activity	30	A
C	3-4	Production activity: --establishing technological line	10	B
D	4-5	--organizing work	20	C
E	5-6	—supply with materials	20	D
F	6-7	--building the product	300	E
G	8-9	Promotional activity: --selecting the medium, public,message	10	J
H	9-10	—launching publicity	20	G
I	9-11	--intermittent publicity activity	30	G
J	3-8	Commercial activity: —establishing the distribution channel --distributing the quantities produced, training of personnel	10	B
K	7-10	—Supplying the unit(start of sales)	20	F
L	10-11	--specialization of the product	300	H, K
M	11-12	--analysis of sales	20	I, L
N	12-13	Technical-economic analysis: —Seeking support for the product, following	30	M
O	11-13	--economic analysis	20	I, L
P	10-13	—new market studies	20	H, K
R	13-14	--making a new decision	10	O, N, P

On the basis of the list of operations and working analysis the graph of the program was outlined as presented in Figure 2.

Figure 2:



Once the table of operations, working analysis and program graph were done, the move was to a calculation of the algorithms according to the methodology put forth, with the results being moved directly to the graph to the right of each node. Since it was observed that the nodes whose values are the same for the maximum and minimum terms and that they are on the critical line, no type of reserve was formulated.

Continuing, on the basis of the same methodology, the move was to calculate the reserves for the other events, the reserves in Table 2.

Table 2: Calculation of Reserves for the Events Included in the Program

1. Activitatea	2. Eveniment inceput sfirsit	d_{ij}	t_i	T_i	t_j	T_j	R_t	R_l	R_i
A	1—2	20	0	0	20	20	0	0	0
B	2—3	30	20	20	50	50	0	0	0
C	3—4	10	50	50	60	60	0	0	0
D	4—5	20	60	60	80	80	0	0	0
E	5—6	20	80	80	100	100	0	0	0
F	6—7	300	100	100	400	400	0	0	0
G	8—9	10	50	390	60	400	340	0	0
H	9—10	20	60	400	420	420	340	0	0
I	9—11	30	60	400	720	720	630	290	290
J	3—8	10	50	50	50	390	330	—	330
K	7—10	20	400	400	420	420	0	0	0
L	10—11	300	420	420	720	720	0	0	0
M	11—12	20	720	720	740	740	0	0	0
N	12—13	30	740	740	770	770	0	0	0
O	11—13	20	720	720	770	770	30	30	30
P	10—13	20	420	420	770	770	330	330	330
R	13—14	10	780	780	—	—	—	—	—

Key:

1. Activity 2. Event--start and finish

With a view to computer processing, a system of programs was made for the Felix C-256 computer. This system of programs uses the PERT CORAIL II package, having the data from Table 1 as the entry data. The entry data were organized into a data base under administrative of the COBRA package of programs.

On the basis of the program established, the computer displays on the printout the design of the graph through a report of the critical line, which includes the prior stage, subsequent stage, name, description of the activity, whether or not it is real, duration, earliest and latest start, both for beginning the activity as well as for finishing the activity, total margin (Table 3, a copy from the printout).

In establishing the program for the computer, fixing the calendar date for beginning the marketing program (in the example given, 10 January 1979), was accompanied by the provision for not taking Sundays and legal holidays into the calculation. The computer showed the calendar dates both for beginning the activity and for ending it, with two alternatives: the earliest and the latest. The calculator also put the activities in order according to the position toward the critical line, placing first those activities which are found on the critical line, without reserves (total margin= 0), then the other noncritical activities which have total reserves.

On the basis of the particular ratio of the critical line, the calculator continues to print out the results, that is, the Gantt diagram, which includes the activity (with the symbol for the start and finish above), the name and calendar by days. To the right of each activity the period of time in which this must be carried out also is placed.

Doing such a diagram offers an overall picture of the entire complex of activities as they take place on the calendar, thus being able to recognize precisely the point when any of the activities included in the program must begin and end.

Adding to the specific calendar for carrying out the marketing program in time, with a view to carrying it out under good conditions, also the advantage of a rapid calculation offered by the computer, we have the complete picture of the usefulness of the method of the critical line in providing efficient management of the activity taking place in our economic units.

Table 3: Report of the Critical Line

PERT CORAIL II
Market Forecast - S1 Network, Subnetwork 1

1. Etape Ant	2. Etape Pos	3. Nom	4. Description de l'activite		5. Duree	6. Debut tot	7. Au Plus tard	8. Fin tot	9. Au Plus tard	10. Marge total
0	1	A	Studiu de piață 11.	R	20	10JAN79	10JAN79	01FEV79	01FEV79	0
1	2	B	Activitatea de creație 12.	R	30	02FEV79	02FEV79	08MAR79	08MAR79	0
10	11	M	Analiza vol. vînzărilor 13.	R	20	20AVR81	29AVR79	21MAI81	21MAI79	0
11	12	N	Analiza th. economică 14.	R	30	22MAI81	22MAI81	25JUN81	25JUN81	0
12	13	R	Luarea deciziei 15.	R	10	28JUN81	28JUN81	07JUL81	07JUN81	0
2	3	C	Activitate productivă, stab. liniei producție 16.	R	10	09MAR79	09MAR79	20MAR79	20MAR79	0
3	4	D	Organizarea muncii 17.	R	20	21MAR79	21MAR79	12AVR79	12AVR79	0
4	5	E	Aprovizionare cu materiale 18	R	20	13AVR79	13AVR79	05MAI79	05MAI79	0
5	6	F	Execuție produs 19.	R	300	07MAI79	07MAI79	19AVR80	19AVR80	0
6	9	K	Aprovizionarea unității 20.	R	20	21AVR80	21AVR80	13MAI81	13MAI80	0
9	10	I	Comercializarea prod. aprovizionate 21.	R	300	14MAI80	14MAI80	28AVR81	28AVR81	0
10	12	O	Analiza economică 22.	R	20	29AVR81	03JUN81	21MAI81	25JUN81	30
2	7	J	Activitatea comercială 23. 24	R	10	29MAR79	28MAR80	20MAR79	08AVR80	380
7	8	G	Alegeri medii publicitate, mesaj	R	10	21MAR79	09AVR80	31MAR79	13AVR80	330
8	9	H	Lansarea publicității 25.	R	20	02AVR79	21AVR80	24AVR79	13MAI80	380
9	12	P	Noi studii de piață 26.	R	20	14MAI80	03JUN81	05JUN80	25JUN81	330
8	10	L	Activitate publicitară 27.	R	30	02AVR79	25MAR81	05MAI79	28AVR81	620

Nombre de solutions 17 28.

Key:

1.	Prior stage	15.	Making the decision
2.	Subsequent stage	16.	Production activity, establishing production line
3.	Name	17.	Organization of work
4.	Description of the activity	18.	Supply with materials
5.	Duration	19.	Building of the product
6.	Start	20.	Supplying the unit
7.	Latest start	21.	Commercialization of the product supplied
8.	Finish	22.	Economic analysis
9.	Latest finish	23.	Commercial activity
10.	Total margin	24.	Selecting publicity media, message
11.	Market study	25.	Launching publicity
12.	Creative activity	26.	New market studies
13.	Analysis of volume of sales	27.	Publicity activity
14.	Technical-economic analysis	28.	Number of solutions=17

8071
CSO: 2702/1

END

JPRS 79584

3 December 1981

East Europe Report

SCIENTIFIC AFFAIRS

No. 723

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JPRS 79584

3 December 1981

EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 723

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SCIENTIFIC COOPERATION AGREEMENTS DESCRIBED

Warsaw NAUKA POLSKA in Polish No 7-8, Jul-Aug 81 pp 123-128

[Article by M.B. affiliated with the Office of Foreign Scientific Cooperation, Warsaw: "PAN Scientific Cooperation Agreements"]

[Text] On 2 February 1981 in Dublin, PAN regular member Zdzislaw Kaczmarek, the scientific secretary of the Polish Academy of Sciences [PAN], and Prof Proinsias MacCana, President of the Royal Academy of Ireland, signed an agreement on scientific cooperation between the Polish Academy of Sciences and the Royal Academy of Ireland and an official record of cooperation between them.

The agreement among other things calls for the two academies to support the direct cooperation of scientific establishments in order to carry out scientific projects which are the subject of mutual interest through such forms of cooperation as the exchange of information and experience, lectures, seminars, consultations, and so on. The document also defines the financial and organizational conditions for the cooperation, the limits on exchange not involving foreign currency, the principles, deadlines, and forms by which the candidates will present themselves, and so on.

The official record on cooperation provides for cooperation between the two academies in the following areas of interest to both: social sciences and humanities, chemical and physical sciences, geology and geophysics, technical, agricultural, and forest sciences, biology, and mathematics. The specific subjects will be defined and agreed upon during 1981.

On 24 February 1981 in Sofia, corresponding member of PAN Z. Gertych, first deputy scientific secretary of PAN, and academician G. Bliznakow, main scientific secretary of PAN, signed an official record on scientific cooperation between the Polish Academy of Sciences and the Bulgarian Academy of Sciences for the years 1981-1985. The Polish delegation included the following persons as well: corresponding member of PAN H. Cholaj, first deputy secretary of Division I: Social Sciences, of PAN, Docent Dr Habilitowany Z. Szoda, director of the Institute of the Foundations of Information Science, and experts.

During the talks which were carried on it was found that the implementation of the problem-thematic plan for scientific cooperation in 1976-1980 had gone as planned and represented an important contribution to the development of comprehensive cooperation between the Polish Academy of Sciences and the Bulgarian Academy of Sciences. With this assessment in mind, along with consideration of the need for further improvement and greater effectiveness of the cooperation and of the two academies' needs and capabilities, it was decided that efforts would be made in the cooperation to deepen cooperation in selected problems, to expand the role of research results in the course of practice, to adopt optimal forms of cooperation, such as distribution of labor, creation of joint research teams, and so on.

As the result of the talks cooperation subjects were established for 1981-1985. The plan includes 23 problems and 40 subjects, and eight of these will be carried out on the basis of scientific coproduction. It was also decided that the working plans agreed upon and signed by the interested partners of both academies would go into effect as of 1 January 1981. An important element in the further development of cooperation is the adoption of the principle that the academies would cooperate in the realm of professional reports and forecasts in the form of exchange, joint participation or joint preparation of the reports; utilization of scientific research; training and continuing education of scientific personnel; financing; effectiveness of international scientific cooperation; legal-organizational cooperation; patent and licensing policy; and so on.

Cooperation between the PAN and BAN [Bulgarian Academy of Sciences] in 1976-1980 initially encompassed 20 problems and 31 subjects. The following new subjects were also included in the plan later: the chemistry of alkaloids; synthesis and properties of phosphoorganic compounds; the kinetic, electrical, and optical properties of suspension foams and flotation systems; the synthesis and construction of crystals of inorganic compounds with certain magnetic, semiconductor, and other properties. Cooperation was also undertaken in the realm of animal husbandry and plant genetics. The two-way contacts between scholars of the two academies were mutually beneficial and produced concrete effects.

Cooperation between the two academies was also more clearly defined in the realm of the construction of scientific apparatus and means of automation and the automation of scientific research. To this end certain organizations of the two academies were charged with drafting direct agreements on cooperation in this area. In view of the stimulation of the creative activity of the scholars who jointly obtained important results in cooperation, it was decided that the first awards would be given in 1982 on the basis of the agreement which had been signed. In addition decisions were reached concerning the conditions and limits of non-foreign currency exchange, the employment of scholars in positions, the organizational conditions of cooperation, and so on.

In the realm of the social sciences we are seeing a lot of activity on the part of the Polish-Bulgarian and Bulgarian-Polish Historical Commission, which is setting up annual sessions devoted to selected historical themes concerning the histories of the two countries. The Polish Academy of Sciences Socialist Countries Institute is cooperating with its Bulgarian partners in the preparations for the second volume of "Dokumenty i Materialy do Stosunkow Polsko-Bulgarskich po II Wojnie Swiatowej" [Documents and Materials on Polish-Bulgarian Relations Following World War II], the joint work on the first volume already having been completed for publication. Also completed is the joint archeological research on the development of the settlement in Oderca. For example, a thorough investigation has been made of the settlement layers from the Hallstadtic period up to the Early Byzantine period. For example, agricultural implements and what we call "comb-shaped" ceramics have been uncovered, and these finds have made it possible to document authoritatively the premises for a description of the development of Early Byzantine ceramics. The work at Oderca has made it possible to state a number of laws related to the progression of defensive fortifications and the building up of the interior parts of an Early Medieval settlement with residential and public buildings, which is of great significance for further research on urban centers of that period in Southern and Eastern Europe. The results of the research were published in SLAVIA ANTIQUA and ARCHEOLOGIA. A comprehensive monograph was published which summed up the results of the archeological Polish-Bulgarian research conducted in the 1960's on the early site of Styrm on the Jantra.

In the realm of the biological and medical sciences, the Botanical Institute of the Polish Academy of Sciences and the Botanical Institute of the Bulgarian Academy of Sciences conducted joint research on the following subjects: flora of Piryn; selected taxonomic plant groups; variability of the Balkan pine and analysis of peat from three highland peat bogs in Bulgaria. This cooperation, for example, made it possible to do comparative studies of certain taxonomic plant groups developed for FLORA POLSKI. The PAN Institute of Biocybernetics and Biomedical Engineering is carrying on consultations and exchanging information in the area of the recording and analysis of bioindicators. The information and experience acquired have been used in drawing up convertors for research on the mechanical effects produced by the operation of the heart and in developing a prototype of equipment for automatic EKG [electrocardiogram] analysis during stress testing.

In the realm of the exact and technical sciences, the PAN Institute of Flow Machinery in cooperation with the BAN Solid State Institute has been conducting He-Cd$^+$ laser experiments with a recess [wnekowa] cathode. This research concerns the homogeneity of current density the length of the optical axis of a laser. In the realm of the subject of alkaloid chemistry research was conducted on the isolation and identification of alkaloids using high-pressure fluid chromatography. Great effects were obtained from research on the recognition and projection of hydrotechnical elements, including the construction and use of appropriate equipment for the modelling of nonstationary filtration. Also effective was research on the use of ash to strengthen weak ground. For example, it was used in the construction of roads and storage sites with an area of 36,000 square meters. Polish technology was used to build waterproof layers for the edges of reservoirs to protect discharge waters and active solutions.

In the realm of earth sciences, the PAN Institute of Geological Sciences and the BAN Water Problems Institute are carrying on research on the lower terraces of the Danube near the town of Ruse, research which is important to the study of the development of large river valleys, including those of Polish rivers too.

The contacts and joint research of Polish and Bulgarian scholars in programs for multilateral scientific cooperation between the academies of science of the socialist countries, CEMA, and Interkosmos have also been fruitful. A total of 1,243 scientific employees went to Bulgaria between 1976 and 1980, and PAN hosted 1,288 Bulgarian scholars.

On 21 April 1981 in Warsaw PAN regular member Zdzislaw Kaczmarek, scientific secretary of PAN, and Tran Dai Nghia, president of NCBN WRS [National Scientific Research Center of the Vietnamese Socialist Republic], signed an agreement on cooperation between the Polish Academy of Sciences and the National Scientific Research Center of the Vietnamese Socialist Republic for 1981-1985.

In the course of the talks the results of the cooperation in 1977-1980 received a favorable assessment, particularly in the realm of history and the continuing education of Vietnamese scientists.

As the result of the talks the decision was made to extend the cooperation agreement beyond the original term and to base cooperation in 1981-1985 mainly on a problem-theme program. The plan includes 19 problems, such as those in the realm of the history of the national liberation struggle; sociology; improvement and development of legal systems; botany of crops; biology of the parasite-host system; prevention and combatting of helminthiasis in cattle; the application of systems analysis and methods of regional analysis and regional planning; solid state theory; genesis and mechanism of the formation of gaps in the region of the Red River delta; geomorphology of the humid zone and deep structures of the earth's crust. Here the cooperating agencies were charged with discussing and signing the working plans, which should include precise goals, forms, duties, deadlines, and the like, along with scientific conditions and organizational details of the cooperation. The protocol also defines the limits on non-foreign currency exchange and the conditions for carrying it out, as well as decisions concerning cooperation between the Center for Scientific Information and the Center for the Dissemination of Scientific Publications, and their Vietnamese counterparts.

PAN's cooperation with its Vietnamese counterparts covered 13 subjects. Among them the most effective was cooperation between the PAN Institute of History

[IH] and the Institute of History of the Social Sciences Committee [KNS] of the Vietnamese Socialist Republic. For example, they drafted a concept for the joint preparation of a collection of articles entitled "social changes in colonial Vietnam prior to 1941," exchanged periodicals, and so on, and IH PAN sent a large number of photographic materials for iconographic and reprographic purposes. Between 1977 and 1980 three Vietnamese scientific employees earned the doctoral degree in PAN facilities. The Vietnamese NCBN and KNS entered into agreements on multilateral scientific cooperation with academies of science of socialist countries and an agreement on the creation of a periodical of the academies of sciences of the socialist countries, USPEKHI MEKHANIKI, an agreement on the creation of the S. Banach International Mathematical Center, and an agreement of the AN KS [academies of sciences of the socialist countries] on the creation of an International Information System for the Social Sciences.

A delegation of the national council on science and technology of Mexico (CONACYT) came to Warsaw with its general director Dr Edmundo Flores on 25-28 April 1981. As the result of the talks conducted, it was decided to sigh a new cooperation agreement which will replace the agreement signed on 3 August 1976 in Mexico. This document specifies that PAN and CONACYT will conduct joint scientific research and give each other mutual scientific assistance. The parties will also exchange informational materials, publications, and periodicals, will exchange scientific employees, will set up joint seminars, symposiums, and the like, and exhibits of publications, and apparatus, and will also exchange information in the realm of scientific, organizational, and scientific research administration. The agreement also specifies the conditions for using the results of joint research for commercial purposes and its industrial application, the conditions recording patents, and so on, and the principles for non-foreign currency exchange, and registration fees. The agreement will be in effect until 31 December 1983, and unless one of the parties wishes to change the conditions of the agreement it will be automatically extended for another 2 years.

In the course of the talks it was also found that the results of past cooperation are creating good prospects for its further development and an expansion of its scope. It was also decided that PAN and CONACYT, in cooperation with the Mexican Academy of Scientific Research, will work jointly on 41 problems in 1981-1982, including those concerning the socioeconomic development of Poland and Mexico; the ecological foundations for protecting nature and natural resources; the physics of the condensed phase; physical changes in the properties of soils under the influence of cultivation; the neuropathology of nutritional shortages; recultivation of land included in the activity of mining hard coal, iron ore, the mining and flotation of nonferrous metals, and water economy and the treatment of waste water.

It was found that the cooperating facilities should work out the working plans, including the subject matter, distribution of tasks, mutual duties, stages, scope of exchange of personnel, persons responsible for results and the proper course of the cooperation.

The protocol specifies the limits for the exchange of personnel and the principles of using these limits, along with other organizational and legal conditions concerning the cooperation.

The protocol and agreement were signed on 28 April 1981 by regular member of PAN, Zdzislaw Kaczmarek, scientific secretary of PAN, on behalf of PAN, and Dr Edmundo Flores, general director, on behalf of CONACYT.

The fourth session of the coordinating committee on the construction of scientific apparatus and automation for research of the academies of sciences of the socialist countries was held in Varna on 5-8 May 1981. Corresponding member of PAN W. Zielenkiewicz, deputy to PAN's permanent representative on the coordinating committee, headed the PAN delegation. Delegations from the Bulgarian Academy of Sciences, the Czechoslovak and Slovak Academies of Science, the GDR Academy of Sciences, the Hungarian Academy of Sciences, the National Scientific Research Center of the Vietnamese Socialist Republic, and the Academy of Sciences of the USSR took part.

After listening to the academies' reports, the coordinating committee, which organizes the cooperation and information of the representatives of the academies of sciences, stated that the charges of the previous session of the committee had basically been carried out and, among other things, details were agreed upon for the "Supplement to the Cooperation Program," a list of equipment developed jointly was drawn up, a list of events set up was drafted, an agreement on the creation of a periodical of the academies of sciences of the socialist countries was drafted, the technical tasks were approved, and so on. On this basis the coordinating committee decided on the usefulness of evaluating the results of cooperation in the realm of the construction of scientific apparatus and the automation of research in 1978-1982, with consideration also given to upgrading the work of the committee and its working groups, along with new proposals concerning jointly developed apparatus. In connection with this decision the academies of sciences were charged with drawing up concrete materials and proposals by 31 October of this year.

At the session of the committee scientific papers were presented as follows: "Microcomputer Automation System in CAMAC Standards," "State and Prospects for Rapid Spectrophotometry," compiled by the Bulgarian Academy of Sciences, and "Experience in the Lending and State Registration of Apparatus in Hungary," drafted by the Hungarian Academy of Sciences.

The coordinating committee approved the findings contained in the protocols of the sessions of the permanent working group on the automation of scientific research, the ad hoc working group on vacuum technology, mass spectrometry with electron spectrometry, and the permanent working group on scientific and technical information and on interacademy exchange of apparatus, spare parts for it, assemblies and elements, and mathematical safeguards.

During the session it was agreed -- later an agreement was signed -- to create a periodical of the academies of sciences of the socialist countries. The title will be APARATURA NAUKOWA [Scientific Apparatus] (Apparatus and Automation of Research). The Bulgarian Academy of Sciences, the Czechoslovak Academy of Sciences, the Academy of Sciences of the Mongolian People's Republic, the GDR Academy of Sciences, the Polish Academy of Sciences, the Hungarian Academy of Sciences, the Scientific Research Center of the Vietnamese Socialist Republic, and the Academy of Sciences of the USSR entered into the agreement. The periodical will be published by PAN. The periodical's goals are the dissemination of information on achievements in the realm of the theory of measurements, the principles and methods of research apparatus technology and construction, and current and long-range tendencies in the development of the construction of scientific apparatus in the basic research fields, and so on. The periodical will appear quarterly, and the articles and materials in it will be published in Russian and English. The periodical will be directed by an editorial committee made up of representatives from each of the academies of sciences which signed the agreement. The PAN representative will serve as the editor in chief. The agreement specifies the tasks of the editorial committee and the editor in chief, as well as the legal, organizational, and financial conditions concerning the publication. The periodical will not be a legal party. The agreement was set to run for an unlimited period of time.

The coordinating committee received information in the form of a report entitled the implementation of "The Long-Range Program of Cooperation Among the CEMA Member Countries in the Realm of the Construction of Scientific Apparatus and the Automation of Scientific Research in the Years 1981-1985 and Later" and information on the results of a meeting of representatives of problem commissions on multilateral cooperation of the academies of sciences of the socialist countries. With this information in mind, the committee decided to inform the chairmen of the problem committees about the automation equipment and devices already developed and produced.

The coordinating committee decided to maintain the past frequency of meetings. The committee's next meeting, the fifth, will be held in Budapest in 1982.

The chairmen of the delegations were received by O. Doinov, member of the Politbureau and secretary of the Central Committee of the Bulgarian Communist Party.

Those attending the meeting viewed an exhibit of scientific apparatus and automation equipment developed and produced in the Bulgarian People's Republic.

10790
CSO: 2602/4

OPTICAL INSTRUMENTS MOUNTED ON SATELLITE DESCRIBED

Sofia RABOTNICHESKO DELO in Bulgarian 13 Oct 81 p 2

[Article by Senior Science Associate, Candidate of Physical Sciences Mitko Gogoshev, director of Yuriy Gagarin Base Observatory, Stara Zagora: "Unique Optical Instrument"]

[Text] Two optical devices are functioning on board the Bulgaria-1300 satellite--an EMO-5 two-channel photometric system and a Photon-1 ultraviolet spectrometer. Their scientific missions involve the measurement of very weak cosmic radiation in the high atmospheric layers.

The EMO-5 measures the intensity in six individual lines emitted by the principal atmospheric gases--oxygen, hydrogen, nitrogen and oxygen ions. From the brightness of the lines one can form an opinion regarding the distribution of these elements in the atmosphere around the entire globe. One of the channels carries on a space scan through a specially devised optical system and constructs a picture of the luminous atmospheric layers. This is a unique instrument and hitherto there have been only a few such devices in outer space.

The Photon-1 ultraviolet spectrometer is also an original Bulgarian development. It makes possible the measurement of radiation in the region of the so-called "vacuum ultraviolet." The instrument operates on a wavelength of from 115 to 260 nanometers--where the human eye cannot perceive light at all. Twenty-five selected spectral lines are prerecorded in its memory and on command from earth the Photon-1 switches to a selective mode.

The first data received from the flawlessly operating Bulgarian instrument are in the hands of the researchers and are being fed into electronic computers. The volume of information is not at all small. In addition to the computer at the base observatory of the Central Space Research Laboratory at Stara Zagora where the optical instrument was created, the territorial computer center at Stara Zagora is also taking part in processing the data. Marvelous spectra have been obtained, while the EMO-5 scanner has transmitted pictures of the luminous atmosphere in the region of the equator.

And as always in science there are also surprises. Spectra have also been obtained of the luminous atmosphere in the daytime by means of the Photon-1 device. From these one can determine atmospheric gas content for a number of gases, including ozone. The optical package is performing the missions assigned to it and the specialists believe that the obtained results will enrich not only Bulgarian science, but world science as well.

6474
CSO: 2202/5

STATE OF RESEARCH IN PARALLEL PROCESSING DEBATED

Budapest SZAMITASTECHNIKA in Hungarian Sep 81 pp 4-5

[Unsigned Article: "Parallel Information Processing, Cell Automats, Parallel Processors, Multiprocessors; The Status of Domestic Research, IV"]

> [Text] "... research and development activity can play a truly significant role in the acceleration of technical development only where 'research-development-experimental manufacture-production-marketing-service' become a uniform process, that is, where the innovation chain develops." -- Pal Tetenyi, "The Sixth Five-Year Plan and Research and Development," TARSADALMI SZEMLE, No 5, 1981.
>
> With this article we conclude that part of our series which reports on the domestic situation. We hope that the questions formulated by the editors and the answers received to them--building on the previous parts of our series--have served to expand the information of our readers. With our irregular initiative, linked to our task of providing information, we have "cast the seed." It is now up to those affected to make better use of their possibilities on the basis of the information acquired at this forum, thus furthering the enrichment of the domestic achievements of computer technology.
>
> We have put the questions into three groups. The first is connected with use or user viewpoints; the second is connected with how one should judge domestic research; and the third is connected with the achievements of CEMA countries. -- The Editors

[Question] What are those areas most in need of parallel processing? What user model do the developers of parallel systems and cell processors have in mind?

Dobo: The application possibilities are virtually unforeseeable. Obviously there are user advantages, for example, in the case of large city traffic control, guidance of complex production control systems and systems to guarantee optimal space occupancy and use (warehouse management, patient assignment, control of information networks, aircraft occupancy, etc.). In general use of such systems could be very advantageous for the creation of quickly changing large and complex data bases with input from many places, for simultaneous retrieval of large volumes of information and to organize and control relaying and intervention. It could play a crucial role in progress in the area of modeling brain function, in reproducing economic processes, in perfecting heuristic methods and in the theory and practice of theorem and program proof by mechanical means. It could have a not to be underestimated role in, for example, number theory research or in the reproduction by mechanical means of genetic processes. Its use in virtually every area of scientific research could bring an order of magnitude, "qualitative" change.

Vamos: Parallel processing is needed in the handling of large masses of data, especially in real time picture processing and other real time tasks where the information representing the input flows in large volumes with relative independence among data.

Doman: Applications areas requiring parallelism (high operational speeds) are: signal processing, radio, radar, EKG, EEG, picture processing, artificial intelligence problems, real time systems and large physical models--geological, nuclear, meteorological and hydrodynamic models.

Kovacs: In order to avoid misunderstanding let us agree that we are using the expression "parallelism" in the hardware sense. We might stress two typical areas for such systems--the case of data traffic distributed in space (adaptive production control) where the data arise and are used in a distributed manner in time and space and "combinatoric explosion" type problems (Brute Force Approaches).

Dobo: I came to be informed, and let me emphasize that I have been. Now that there have been several answers to the question asked, and I have expressed my opinion also, I feel that it might be worth while to return to the theme of so-called task structure--in connection with this very question. Let us recall that Neumann conceived of the cell automat system as a sort of brain modeling. The modeling of a brain process is really a stochastic model, a stochastic process.

It is a fundamental characteristic of a deterministic process that it starts from a fixed state. A transitional function is deterministic if it unambiguously states what other state a cell enters from the existing state. A stochastic system only states with what probability the cells may enter another state. Let me ask the researchers present how their research relates to these two systems. Are they deterministic or stochastic? From the viewpoint of future applications I feel it is essential to clarify this because the question is being examined now from the mathematical side and the research is extraordinarily difficult and profound, on such themes as Markov chain controls and guidance, semi-Markov processes and semi-Markov decision processes, the essence of which is that a system will go with great probability from an existing state into a previously determined or desired state or aggregate state. If this can be modeled in a mechanical system then I feel we will be much closer to that Neumann idea which tries to model brain processes. To put it differently, what is involved here is the operation of model systems for heuristic modes of thought. So I would ask my three colleagues whether their systems are deterministic or stochastic.

Fay: Stochastic! But I do not think the word stochastic has to do with probability. Chance yes, but probability no. The calculation of probabilities deals with chance mass phenomena. With phenomena where relative frequency shows stability. In my opinion parallel systems can be used where chance plays a crucial role. Human brain processes are this sort of thing by virtue of their creativity and heuristic, and the MIND computer was prepared expressly for this sort of thing. What areas need parallel processing the most? I think those where chance has a crucial role and those where there are no ready schema, no formalism.

David: The examples just given by Andor Dobo are actually stochastic in the classical sense. So they involve Markov chains.

Dobo: In regard to thought--or the process of creation--I am not sure that we can talk about a Markov chain in only the classical sense.

David: But in learning theory we can! I feel that non-deterministic programming stands closer to the present architecture than learning modeling.

Legendi: This question of deterministic and non-deterministic should be clarified. All three systems, at the level of hardware realization, consist of a system of finite deterministic automats. At the level of hardware realization these are deterministic machines. So are our computers today.

To return to the question itself, we have heard a lot in the course of the day. I would like to mention such general (naturally parallel) tasks as vector and matrix operations and the processing based on these. Even in regard to the everyday areas of computer technology I could mention data processing tasks where the same operation has to be carried out on many millions of records. But I also might mention as examples such tasks as tasks requiring pipe-lineable parallelism, various forms of picture processing and the processing of finite elements in engineering. Whether we carry out all these tasks now on a universal machine, a universal cell processor, a special purpose machine, a partially special purpose machine or in a partly wired manner depends on what we want. The examples include, for example, machines which carry out swift Fourier transformations, and that is the only thing they can do, carry out swift Fourier transformations with great speed and very good hardware cost.

Domolki: Actually, I would like to make a bit more precise the first part of the first question because I feel that two questions are being answered here at the same time. One is what areas require and the other is what areas make possible parallel processing. I believe that the answer given by Tamas Legendi is directed primarily at the second question. To the first question I would give the very unambiguous answer that these are those tasks, and only those tasks, requiring great speed or large computing capacity within a time unit.

Fay: Can we stop to debate a bit? Just as I did not agree with the justification of a word which you did not use, "the structure of task solution", so I cannot agree now that parallelism and speed can be somehow related. If I had to add up the first 10^{50} numbers and did not have the algorithm for it then the capacity of all the computers in the world would not be enough. It would take many millions of years of machine time to add up the first 10^{50} numbers. But if I was clever then I would write the formula and in a certain sense I would have solved the task. The structure of a problem is not a specific of it. Just as its structure is not a specific of it (because I extract it or put it in, I notice it) so its parallelism and time requirement are not a specific of it. In my opinion a task does not have a time requirement. This depends on two things, this is a two value relationship; the time requirement Y of task X depends on the knowledge of person Z, on his preparation or the algorithm of the solution.

Stuka: A task has a structure because a task comes from real life and life has a structure, otherwise we could not exist in it. So the answer really is that we must use parallelism in those areas which make this possible. In the present case this affects those tasks where the processing need is great and identical from the viewpoint of many data. If we carry out another task with similar speed this means a certain redundancy, because you have to wait for the switching processes. So this is how I would make more precise the formulation of Balint Domolki. From the viewpoint of computer technology the concept of information is very broad; it can be one bit, one number, a section of text or data made up of several thousand items. Parallel processing must be judged from the viewpoint of the quality of the information to be processed. When the possibilities of parallel operation of peripherals appeared in operating systems that was already a parallel level. The three systems described by the researchers are parallel on different levels of information processing. Fay's system can be used sensibly if the workers get a sensibly formulated task. Thus, when the information and the processing algorithm are concretely formulated at a level where they can be "loaded" into the computer and a concrete task solved. The Szeged group is dealing with tasks where the processing algorithm is already given. Here the tool may be ahead of present applications levels, but this is not a problem for development is always driven by dialectic contradictions. If the tool is capable of more then sooner or later applications will appear which can use its properties optimally (or the tool will disappear) while urgent applications tasks will produce the suitable tool (for example, interactive methods produced the picture tube terminal).

Doman: Obviously parallelism should be used on tasks requiring great speed. I think the question suggests what problem areas fall in this sphere for us (thus, not in general). And this decides whether it is worth while to deal with this in Hungary. Obviously if the task requiring such speeds today were only how to guide a space ship or rocket, and nothing else, then probably this area could not develop so much here. I believe that this question awaited not only the establishment of this, but much rather whether it is worth while for us to deal with this here, whether it is worth while to do further research.

Legendi: What situation is a person in in Hungary? Is it valuable or even sensible to do research? Unfortunately we are not a developmental division of some world firm where they expect results from us every day. We are dealing not only with what is truly our concern. For example, I went for ideas to the users, to the picture processors, to the engineers, to the computer centers to learn what might be needed. I tried to orient myself so that the basic research would be capable of serving these needs. So Andras Doman is right. We are working and living with conditions and we receive support for our work which make us pay attention to this. We turn a significant part of our work to finding real, sensible applications, so that pointing out the correct path will drive our basic research in an even more correct direction.

[Question] In the light of domestic conditions, how can the developmental achievements in connection with systems working in parallel be put into practice?

Vamos: Domestic research in connection with parallel systems is still in baby shoes; before it can be put into practice the experimental research phase must be strengthened with real results.

Kovacs: For example, by a spread of the cell automat concept for adaptive production control systems.

Dobo: In part this means that we must support in this area those researchers doing worthwhile work suitable for this, helping them to achieve even more and more profound theoretical and practical results. In addition it means taking more circumspect care to put in leading positions people who are not only apparently but really receptive to scientific methods, who consider the utilization of the scientific results achieved to be self-evident, who do not constantly repeat that they are not interested in the introduction or utilization of scientific achievements. At every level there is a need for leaders who regard it as their fundamental moral obligation to discover the possibilities, even if for the moment they get no material profit from it. It is true that the present regulators of the economic mechanism can sometimes put a brake on this. It is essential, however, that this should not be the primary determinant of the ethical or economic behavior of researchers or leaders. On the contrary, the latter must have an effect on the regulators of the economic system. Unfortunately we are forgetting this today, we want ethical norms to exist in themselves, we try to derive them in some obscure way from the regulators of the economic mechanism.

Legendi: It will be difficult but let me try to elucidate. Things can be made useable only if they are treated as complex research. We must find the suitable users, all the way from the theoretical foundations to application, and (as I have said already) we, unfortunately, must seek out ourselves even the financing possibilities. In the near future we must build our research on the existing parts base, even on those parts which can be found in the shops. We must seek out real, living tasks and must ensure that they can be carried out in case studies or on machines which can prove something. The journal SZAMITASTECHNIKA is serving this on this occasion also; it has brought together researchers, developers, manufacturers and those providing the support. One of the basic problems of computer technology as a whole is how to jam the tasks into computers with finite speed and of finite size.

If we carry out a more basic analysis of the process of algorithm preparation then we may discover that in many cases this will do a large part of the work (which would not be needed if we were using very large, high speed computers).

Balotai: Let me say that I did not come here just to listen. I am leader of an industrial enterprise employing 2,000 people; my chief task is automation. I can say that I consider this program a good initiative. In the recent past we have been in direct contact with Gyula Fay and Tamas Kovacs. Today also I have gotten very useful personal information on this theme. For my part I would consider it a very good initiative if we could continue this conversation later, if there were even more industrial leaders here to give and receive ideas. In my opinion we should jointly find those ideas the realization of which can be begun as soon as possible (with our common strength and common material expense). I consider this a very essential goal. For our part we would like to continue such steps as a continuation of steps we took earlier. It is certain and it must be seen that the material possibilities of the industrial enterprises are hemmed in today by restrictions rather difficult to break through. But the situation is not hopeless. The leaders of the enterprises must decide with great responsibility what they consider important (but they are leaders because they have undertaken to do this). Our conviction and our activity proceed unambiguously in this direction, that carrying out the tasks of automation, beginning yesterday already, is unrealistic without the application of ever more fundamental computer technology tools and methods. I would like to repeat my suggestion once again. Whether here or elsewhere we should create a forum with an even broader scope so that we can learn, looking with the eyes of a chief designer, what research results can be realized already.

[Question] Can we expect from the parallel systems, including the cell processors, a better performance/price relationship than from classical sequential systems?

Dobo: Because of the high level of parallel operation--as a result of which virtually every cell of the computer can operate usefully at one time--and because of the possibility of high speed signal transmission performance (computing) increases; at the same time, because the system can be built up of identical cell-circuit elements, the (nominal) production price decreases. So the performance/price relationship will be substantially better than in the case of classical sequential systems. Not even to speak of the cost savings which derive from the homogeneity of the manufacturing technology. The performance/price relationship is also improved by the fact that a cell automat can be expanded without limit thanks to connection without interface.

Doman: A significant performance/price improvement can be expected in the application of parallel computers, but this will require very great research and development expenditures, which will be repaid only after a long time.

Kovacs: Absolutely.

Vamos: There is not direct answer to the question. It depends on the task, and is linked to the answer given to the first question.

Legendi: I can definitely say that one can expect an improvement of 2-4 orders of magnitude; but I suggest that we "run this through" one time with concrete data.

Fay: I think that these parallel systems are qualitatively new, so they cannot be characterized simply by a quotient.

[Question] The majority of the manufacturing firms of the world are dealing with parallel systems (cell research, manufacturing several, even putting them on the market). These include, for example, the AP 120 B, the matrix processor developed and manufactured by the industry of the Bulgarian People's Republic and the German Democratic Republic and the cell system Distributed Array Processor developed by ICL. What is the domestic situation in regard to research and manufacturing possibilities in connection with parallel systems in general and especially in connection with cell processor architectures? Do Videoton, Vilati or others in this area plan development and manufacture?

Balotai: We are making plans! We are interested! At present--and this will be true for a couple of years--we do not have an independent research and development capacity for this purpose. We would like to participate in a scheme where we would be able to play a role in the manufacturing-experimentation activity needed for application, following research.

Stuka: Hungarian computer technology research is a good 20 years ahead of the computer technology industry. So it is not probable that we will be able to liquidate the gap between research and the level of industry in regard to cell automats. Hungarian computer technology industry is 10 years old. Those computer technology industries which are supporting cell automats are not 10 years old, they are already producing profits which permit them to do anything. In my opinion our cell automat research should not go farther than the average organizational level of Hungarian research. People and schools do research. We should evaluate the activity of the research staffs, see what equipment they have (because little can be done here with paper and pencil alone), and then decide what to stress. This is a path which can be followed.

Domolki: Obviously it does not follow from the fact that they are dealing with cell automat themes at the industrial level in many places that we must do the same thing, but the opposite does not follow either. One can imagine a situation where one might cut corners just here, a possibility of realizing the principle of uneven development. I would like to add the following thoughts to this. In his introduction Tamas Legendi noted that there has been continual, organized cooperation between the SZKI [Computer Technology Coordination Institute] and the Szeged group for 3 years already with the goal of trying to provide a sort of "interpreter" between the Szeged theoretical research and contemporary computer technology reality. In part this was to force the Szeged group to try to find practical applications areas, to deal with methods which could be realized in the Hungarian reality of tomorrow or the day after tomorrow. In addition this was to make those working in practical development become acquainted with these things and try to be a partner. (Naturally the first half of the task is going more easily for the time being.) In order to answer the question posed I would like to recommend that if other potential manufacturers or users want to join in an examination of the applications possibilities of cell processors we would be happy to extend to them also the above mentioned "interpreting" activity.

Legendi: That is exactly the situation, there is a need to force closer contact between researchers and users, as Balint Domolki said, to go from research to development, with a product-oriented view, and go from there toward industrial realization.

Research

[Question] How well organized is research in our homeland in connection with parallel computer technology systems and cell processors? Is this research linked into the national target program?

Doman: As far as I know research on parallel computing systems is not linked into any national or other research program; it is largely made up of personal undertakings, undertaken as a hobby, which have been able to get some support from here or there. There are ad hoc domestic achievements in connection with parallel programming--as a result of individual initiative.

Vamos: This research is not really organized, and for the time being this is not needed because it is not far enough along to be formed into a project. At the present level of research the groups must prove themselves. On the other hand, good communication among them is needed.

David: Of the four research themes recommended for architecture research in the sixth chapter, "Computer Science Basic Research", of the sixth five-year plan of the SZKCP [Computer Technology Central Target Program] three are unambiguously connected with parallel systems:

--high level parallel computing systems,

--research on new architecture principles, and

--computers reflecting the structure of problem solving.

We hope that they will receive support.

[Question] What possibility is there for other utilization of domestic architecture research or software developments (for example, foreign cooperation or sales), especially if the lack of manufacturing interest, technological level or other conditions does not make possible the manufacture of domestic tools in the near future?

Domolki: The answer is not a specific one in regard to cell automats. If any Hungarian intellectual product can be sold abroad at a suitable price and under suitable circumstances, and if this does not clash with serious domestic interests, then the present trend of our entire economic system suggests that we should do it. The most natural answer to this question would be: Where is there a customer who would want to buy our achievements in connection with cell automats? Obviously it would be good if they could be sold to a domestic manufacturer, but it is certain that a well selected foreign cooperation would carry the matter further ahead materially, in regard to parts and from a number of other viewpoints.

Szabo: The question arises here, Who is waiting for whom? Is the researcher waiting for industry, or is industry waiting for the researcher, for research results? How can this develop without coordination, without appropriate contacts? Who will take it into his head, and at what moment, that the achievements are marketable?

Balotai: In my opinion we can plan with certainty for a long time what possibilities domestic manufacture will have, whether utilization of existing or hoped for achievements will produce harmony or disharmony. Unfortunately, as Tamas Legendi said in connection with VLSI, it is not very comforting. Such technology can hardly be expected in the course of the realization of the central electronics developmental conception extending to 1990. At the same time, we must put the developments which have begun on a basis of reality. If we can get something with out intellectual goods which can be sold then obviously we should do so. At the same time, I say that if our intellectual achievements reach the world level and there is a good marketing possibility then we need not think about it but should sell where and at what rate of exchange possible. It is certain that we will not be able to sell it for as much tomorrow.

As to the question, who is waiting for whom, I would like to say the following. No one knows anything. Everybody is waiting on somebody else. There are not only two in this circle, researcher and manufacturer, as the question suggests. The circle is quite wide, and there are many on this nice little "revolving stage" beginning with those guiding research and development through those guiding industry. On the basis of the economic view we have only one choice, we must do what we can.

Legendi: I believe that it appears from the answers thus far that in general we lack in Hungary a flexibly intermediating stratum; even responsible leaders say that everyone should handle his own problems. I have experienced myself that it is difficult to establish foreign contacts. A person must acquire and organize everything himself. I would like to say that we have already received a commission from the GDR, if not to build, at least to design a picture processing or pre-processing processor. They would build the system from traditional elements. (This would be capable of about 80 million simple operations per second.) We also have cooperation contact with a partner in the FRG on the basis of an interstate DFG-KKI-MTA [KKI, Institute for Cultural Relations; MTA, Hungarian Academy of Sciences] contract, by means of which the project finally got through a rather strong foreign filter. On the basis of their theoretical and cell programming achievements they also prepared a simulator and a new type of cell algorithm. The cooperation was useful to us from several viewpoints. In the first place our work got some exposure and in the second place this represented some control. We would like to use this contact as a window for possible realization with western hardware technology.

Kovacs: In the mid-1970's there was a French initiative in the KGM ISZSZI [Institute of Industrial Management, Organization and Computer Technology of the Ministry of Metallurgy and the Machine Industry] to create a joint Hungarian-French research base for cell automats. The earlier offer was upheld on the occasion of the 1980 visit of professor Jacques Riguet (Sorbonne) to Hungary.

Results

[Question] The results of the three trends presented by the developers have become known in different ways and at different levels (although they may have grown out of one school). What is the domestic judgment of these trends? How do those responsible regard the importance of the domestic research and development?

Vamos: I consider the works of Legendi worthy of support; the theoretical efforts of the school approaching from the macro side are also interesting; I have given my opinion of the Fay matter, completely negative.

[Question] What results, in connection with the development of parallel computer technology systems, are known, primarily concerning research or manufacture in the CEMA countries?

Domolki: There are results. Several matrix processors are known or are under development in the ESZR [Uniform Computer Technology System]. They are doing rather intensive research in the Soviet Union. In addition we know of isolated research (at about the level of what we have been hearing about) in the Soviet Union, Bulgaria and other socialist countries. We cultivate our contacts at the customary level of contacts between socialist countries.

Fay: I might mention, in this regard, the Aladyev school in Tallinn. They have a little greater scope but in my opinion they are in the same depressed situation as Hungarian cell automat researchers. Their achievements are very diffused. They have an extraordinary number of publications, but I have not seen a trace of their work appearing in industry or in use ....

Kovacs: One should mention primarily the activity in the ESZR of the section called "homogeneous computer technology structures."

Vamos: It appears that array processor developments, to carry out matrix operations, have made progress in other socialist countries, and this is a good thing. Their parts base is obviously obsolete, and this makes realization dubious. One must go in a different direction in the not too distant future; in my opinion we will see the unfolding of two chief tendencies. One is special processors to do special tasks, primarily in the area of picture processing. The other will be networks made up of greater capacity processors, which will be able to cooperate flexibly in a cooperative system. The first overpowering example of this is the INTEL-432. It can be seen from this how much the earlier ideas about cell automats have been modified by the revolution in parts development.

Dobo: In my opinion it would be correct, in regard to Hungarian cell automat research, to start from the principle which Mihaly Sandory formulated, namely that it should be financed depending on the people involved, and there are not many people in Hungary who can deal effectively with cell automat research. If we take this into consideration then I feel that 5-6 million forints per year would be very serious support to aid research. It may be that there are privileged areas, but globally we are at the point that we do not want even 5-6 million forints, cannot "tear it out" for this theme. I consider this extraordinarily sad.

Stuka: Do not get angry, but by my calculations this 5-6 million per year has been "torn out" already.

Dobo: Did cell automat research get 5-6 million per year for the past 3 years?

Stuka: You mean central funds?

Dobo: Yes.

Stuka: That is different!

Dobo: Why, what else should I be thinking of?

Stuka: Enterprise contracts, for example. The collectives represented here represent 10-15 people; these people may not constitute the entire staff. The "price" of one researcher comes to a quarter or half million forints per year, if we add everything together; this is no small sum.

Dobo: Why does not the enterprise mechanism permit us to finance research at their expense more easily?

Stuka: Why does not research produce results which can be used by an enterprise within the interval which can now be foreseen by the enterprise mechanism?

Dobo: Because in general the researchers who are worthy of it do not get the money.

Stuka: That is why I said we must think through and review the Sandory principle.

Dobo: Why now? Where have we been for 10 or 20 years?

Stuka: Did anyone say this 20 years ago?

Dobo: Yes! Just go through the publications of 10-20 years ago.

Szabo: I believe we should conclude our conversation now, before a sharper debate develops.

[Editorial conclusion] We can say that the entire conversation was unusual. The number and content of the comments helped all of us to see into the not exactly reassuring situation of some researchers forced to the periphery of their profession, and it helped us to enrich our knowledge.

We hope that the participants in the conversation came closer to one another, both professionally and personally, and we hope that research also received a new impetus with our program, our information and this series.

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NATIONAL MEETING WEIGHS ROLE OF TECHNICAL INTELLIGENTSIA

Budapest NEPSZAVA in Hungarian 4 Oct 81 pp 1, 5

[Article by P. F.: "Technical Intelligentsia for Accelerating Economic Progress"]

[Text] The Federation of Technical and Scientific Associations [MTESZ] held its 13th general assembly of delegates on Saturday [2 Oct 81] in the party committee headquarters of [Budapest's] 13th municipal district, with the participation of 700 delegates. They represented about 17,000 technical, scientific and agricultural professionals, members of 32 member associations and 22 regional organizations. Members of the Politburo Gyorgy Lazar, president of the Council of Ministers, and Gyorgy Aczel, deputy prime minister [also] participated in the conference. Representatives of the MSZMP Central Committee, the presidential council and the government, as well as of several social organs were present.

Co-chairman of the MTESZ Miklos Ajkai welcomed the general delegate assembly's participants and guests. He emphasized that the professional intelligentsia has a fundamental role in our national economy's further growth. This will require even more responsible work than before from them as well as from the federation.

After selecting the working committees Janos Toth general secretary added some supplementary remarks to the presidium's written report.

Dr Janos Toth: We Provide the National Economy with Practical Assistance

In introduction the general secretary of MTESZ summarized the results of the work the federation has done since the 12th delegate assembly. He emphasized that in the interest of implementing the social and national economic goals the federation has been striving to adapt more flexibly to the changing circumstances. This better served technologial progress and reinforced the appreciation of professional intelligentsia. We can point at significant successes in a number of important work areas--he said--then continued:

"The content, style and methods of the federation's and of the associations' work adapted to the new tasks and became more useful, more practical for the national economy. After the NSZMP's 12th congress our professionals concentrated their attention more and more on the selected tasks important from the viewpoint of the national economy's growth. The federation encouraged and followed with attention the good suggestions of technical intelligentsia, and the implementation of their ideas."

"Which are the areas where in our judgement progress was slower than would have been possible? Our presence in the plants is not yet satisfactory" he said. "In some of our societies young professionals are not involved enough in the work. We are not yet taking sufficient advantage of our great intellectual reserve, the intellectual capacity of our retired people."

Speaking about cooperation between the MTESZ and the social organizations Dr Janos Toth dedicated a separate paragraph to the strengthening and richer relationships with the trade unions.

"Our work interfaces with the work of the unions at so many points that it would even be difficult to list them all"--he emphasized. "Thus I will only mention the most important ones: Assistance to implementing the Sixth 5-Year Plan, social tasks which occur within the plants, and the various problems of providing financial and moral incentives to professionals. But speaking of this, one thing must be made clear: We do not have and never had the idea of becoming the interest protecting organization for technical people, nor to handle such assignments. This would be impossible, considering the tried and true political mechanism of our society and the way it operates. Our responsibility is of a different nature, and the social weight and importance of this is no small thing, either."

Following this, the general secretary of MTESZ talked about the reserves in the federation's work. The federation of technical intelligentsia must constantly keep an eye on those circumstances and effects which accelerate or slow down the growth of domestic science and technology, or in a broader sense the innovation. These may be technological, economic, social, financial, management, regulatory or even human factors. We must become society's "technological conscience"--the secretary general emphasized.

Following this he mentioned some of the problems defined by the membership meetings of associations.

"I would like to recount some of the questions the associations and the presidium of MTESZ have been discussing. To mention only the most important ones: Much has been said, for example, about how the technical careers can again be made attractive."

He then spoke about the MTESZ initiatives which serve to make the technical careers more attractive, and to improve the livelihood situations of the technical intellectuals. The federation also called attention to what comprehensive reforms are needed in the area of training plant engineers and technicians, and that instead of performing routine tasks the plant engineers should be able to spend more and more time and energy on creative work.

"That is, the majority of our technical intellectuals do their work with the necessary preparation and responsibility, and could even do a lot more than they are doing now"--Dr Janos Toth said. "We must add to this that some of our professionals possess outstanding knowledge, experience and creative ability even when measured by international standards, and this is also accompanied by zealous enthusiasm for their vocations. Our past economic and technological-scientific results are inseparable from the work of this group, and the implementation of our future tasks can also be expected mostly from them."

This and similar positions taken by the MTESZ have a very big role in the situation of the technical intelligentsia being placed on the agenda in more and more forums. More and more peole realized and mentioned the sharp contradiction that social recognition for the work of our professionals and their relative incomes have sunk to the lowest point at exactly that critical time period when our economic goals demand greater efforts than before from these very same people.

"We are aware of the fact--the secretary general of MTESZ said--that the problems of the technical intelligentsia shown here can only be solved in conformance with our economic policy, that is, within the framework of selective industrial development and differentiated wages according to one's performance. We are therefore awaiting measures which will effectively aid in the financial and moral recognition of knowledge and performance. But the enterprises could be doing more even now to implement differentiated wages."

"With this now the MTESZ must also move past the listing of problems. We need to contribute to help change that economic and social microclimate and those interest relationsips, management and regulatory methods which today at the enterprises and institutions act against--because, unfortunately, they do act strongly against--paying wages and bonuses on the basis of actual performance."

In closing parts of his speech Dr Janos Toth empahsized that the Hungarian technical, scientific, agricultural and economic intelligentsia, which has a great past, will stand its ground also in the future, true to its progressive national traditions. The federation helps its members keep up with the growth of their professional areas, and offers a "role" for them to take part in the public life.

The federation will make a dual role for itself also in the future: In the interest of competitive production it will contribute to accelerating technological progress, and will participate in the further development of the institutions and methods of our democratic public life. These are tasks for which it is worthwhile and possible to do even more successful social work with enthusiasm than in the past--said in closing the secretary general of MTESZ.

Following the secretary general's report and the reports of the control committee and by committee for drafting by the bylaws, the debate began. Gyorgy Aczel deputy prime minister and Laszlo Gal deputy secretary general of SZOT [National Council of Trade Unions] also made comments during the debate.

Gyorgy Aczel: How to Better Manage Creative Energy

Gyorgy Aczel relayed greetings from the Central Committee and from the government, then spoke about the increased role and responsibility of the technical intelligentsia. Primarily as it relates to our domestic economic life, but also from the viewpoint of the international respect our national economy and our country enjoy. He addressed--as he said--this latter theme because it is well known that different winds are blowing in the world's economy than before. He emphasized that we must first of all solve our own problems, since only this way can we be competitive also in foreign markets and in the international economic relationships. And here in this county, considering the domestic as well as the foreign factors, the primary requirement is for us to change over as soon as possible to reasonable, really rational, intensive and frugal economic operation in the best sense of the word, in order to remain "standing" in the foreign economic field, and be competitive.

The government's deputy prime minister drew a parallel between responsibility for economic operation and for its success, and the role and significance of the technical intelligentsia in such a way that these latter can and must do must to preserve and even increase our competitiveness. In order to discover our domestic reserves as soon as possible and as broadly as possible--whether we speak about modernizing production, differentiated product development, or smarter management of the intellectual capital. Only those--either as leaders or as subordinates--can represent this ideology and can implement it in practice who feel and know that we can get out of our not-so-easy problems only by joint cooperation, common desire, and the joint solution of our problems, but to do this everyone must offer the maximum of his knowledge and performance capacity. And this must be done in such a way that in the meanwhile everyone must also be thinking: No only about following the rules, the "regulators" but also about what could and what should be done in a smarter way and better than before. And while this is being done--Gyorgy Aczel emphasized this--nobody must be offended by strict but wise criticism, everyone should receive the "good word", the combined wisdom of manual labor, creative technical professionals, and management. This is the opinion for which knowledge of the subject and the intention to make improvements represent a common denominator at all levels.

The deputy chairman of the Council of Ministers spoke about a projection of the basic truth of "thoroughly trained heads" through whom we must increase our performance capabilities and prestige here at home as well as before the foreign countries, from intellectual conception to implementation incorporated in products. And in order to do this, he emphasized--and referred to the position taken by the 12th [party] congress--smarter management of the human factors, manpower, abilities, time and energy is needed. The technical intelligentsia also has the responsibility to consider these factors together. They should not and must not be labeled with the adjectives "professional barbarian" or "progressive" we've heard before, because the ability to do work, to implement something is one thing, and quite another thing is knowledge, sensitivity and receptiveness to invent new things, to establish foundations for them.

One realistic problem is that the small plants which are indispensible to our growth, syphon off the well trained manpower, including the technical professionals, from the large enterprises. But only from those which do not think properly, and which do not furnish good working conditions, do not encourage and appreciate the development of creative ability.

We value highly the activities of those who are racking their brains [sic] for newer and newer solutions with the intention of making improvements--he said--whether they work as professionals, as creative associations, or as production shops, since every achievement we reach serves the interests of the national economy. We know that transfering new ideas into practice is a responsible job and time is needed to accomplish it. But time is short, and no enterprise must abuse patience. The technical professionals or intellectuals with economic or other training must not abuse it just as enterprises or management must not do this.

On the subject of managerial responsibility the deputy chairman of the Council of Ministers also said that poor management of creative energy, of professional know-how and of readiness to act, and in general the failure to take action are at least as serious errors as wasting financial resources or taking the wrong action. And such shortcomings must not remain at the level of "having been established"--holding the persons responsible is an action which must be followed in order to eliminate such failures.

Gyorgy Aczel also spoke of the fact that a significant proportion of the young people are not familiar, or are just barely familiar with the opportunities and the beauty of the technical careers. Fewer people know the names of the outstanding practitioners of these areas, of the Kalman Kando's [electric locomotive] of our days, than even the name of a mediocre hit song's composer. Our joint responsibility is to change this situation as soon as possible.

Gyorgy Aczel also underlined the role the technical intelligentsia has accepted and fulfills in the economic operation's success, by saying that the inventor should own his ideas not only until he has come up with them, but all the way until they are implemented. This is also a fundamental obligation and responsibility of management. And this must be so in the sense--as the government's deputy chairman pointed out--that in addition to having the technologial knowledge, a good manager must also prove his political suitability, and not only his trustworthiness, by demonstrating that he is not only receptive towards new things but also dares to and is capable of undertaking projects and accept risks in the interest of better results. For example, by assigning well trained young people to work with the highly knowledgeable and richly experienced older professionals, encouraging them, and giving them specific assignments to carry out as their daily tasks.

In closing, Gyorgy Aczel emphasized the increased role of MTESZ in carrying out our economic tasks, by saying--as he worded it--that the technical intelligentsia which numbers several hundred thousand professionals in the country, not only enjoys the government's trust but also has the obligation to promote with its knowledge and know-how the solution of our future national economic tasks.

Laszlo Gal: Let's Appreciate and Take Good Advantage of Intellectual Work

Laszlo Gal deputy secretary general of SZOT greeted the delegate general assembly of MTESZ in the name of the National Council of Trade Unions, then continued his comments with these words:

"We are living in very difficult times economically which will lastingly influence the further growth of our society and of our national economy. We will have to solve some large tasks in the coming years. The trade unions feel they have a great responsibility to activate the broad strata of intellectuals--particularly the technical and economic intellectuals--in the interest of implementing our common goals, to creatively participate in orgaizing, directing and executing the tasks which have signifiance for the entire national economy, and those emphasized by the enterprises."

After this the deputy secretary general of SZOT spoke about the reserves concealed in the cooperation between MTESZ and the trade unions, which reserves have thus far not been sufficiently exploited:

"We must together strive to make the forums of the plant democracy more practical and richer, and in this we intend a big role also for the technical intelligentsia."

"The technical intelligentsia also has a similar key role in the socialist work competition"--Laszlo Gal continued. "Intellectuals in positions of leadership can do more in the interest of saving materials and energy, and of more economical and more efficient production, which is the most significant source of preserving and further improving our standard of living."

The trade unions consider it important that creative work should be ranked as highly as it deserves on the basis of the role it fulfills in the development of technological culture and of the scientific revolution. This is why it is important to implement the joint programs with the MTESZ, and to deal with the actual and deserving issues.

"We are working on eliminating the shortcomings which still exist in financial and moral appreciation, and on changing the attitudes which hinder this. In our evaluation the wage ratios last year did not develop completely appropriately in this county. It depends primarily on more flexible enterprise policies that the payment of differentiated wages according to the performance of creative work should become universal."

The deputy secretary general of SZOT said that the expected modernization of management's wage and premium system and organization of the innovation resources and fees paid for contributions--even if it will not solve all the problems--may contribute to the development of creative work.

"The social policy benefits available to technical intelligentsia are roughly the same as those of the other social strata. The problems are also the same. Such is, for example, the establishment of a home. In the opinion of the trade unions the comprehensive reform of housing distribution, of the entire system of obtaining an apartment may ease these problems somewhat."

In conclusion Laszlo Gal talked about the need for continued cooperation between the trade unions and the associations, emphasizing that a closer relationship between the two organizations can have a positive effect on the intensive work of our intellectuals to achieve our social goals, and on the more vigorous growth and utilization of creative intellectual work.

Debate of the General Assembly of Delegates

More than 30 people spoke in the debate of the general assembly of delegates representing various professions and associations. The brief introductions and critical explanations sketched a picture of what occupies the technical intelligentsia of today. Primarily, they want better opportunities to increase their capabilities, and better recognition by society of their accomplishments.

Several speakers dealt with the factors which hinder rejuvenation of our production. For example, they called attention to the need that the guiding organs of our national economy should rely more on the proposals worked out by the associations when they determine the industrial or agricultural policies. The intellectual capacity of engineers should be used more intensively in designating the direction of development in the megyes. In general: The "socialized knowledge" of technical people should be given a greater role in the preparation of decisions, and the public opinion should acknowledge it as valuable social work.

Social recognition which is perceived to be uncertain--and which is also reflected in the incomes--does not make technical careers sufficiently attractive, and erodes the intellectual quality of the engineering generations of the future. This is why several speakers mentioned that paying differentiated wages measured by performance should be applied within broader limits, and bonusses should express the significant differences between jobs and abilities. The rank of the human factor must be reflected in practice, since our society's success and the rejuvenation of our production depend primarily on the "thoroughly trained heads", on their know-how and creative ability. The conditions must be changed with the man in mind who wants to create. The regulations, incentives and financial resources must be changed in such a way as to encourage innovation.

The multifaceted debate was summarized by secretary general Dr Janos Toth. After the report by the mandate verification committee, Dr Gabor Soos reported on the nominating committee's activity. The now traditional MTESZ prizes within the framework of a ceremony to 35 professionals who work with outstanding results in the federation or in the associations.

The delegates elected the National Presidium of MTESZ by secret ballot. It held its firt meeting after the general assembly and elected its own officers. Jeno Fock was reelected as chairman of the MTESZ. The co-chairmen are: Mikols Ajtai, Gyula Horgos, Albert Konya, Gabor Soos and Ferenc Trethon. Dr Janos Toth was reelected as secretary general of the federation, and Zoltan Boross, Janos Fuzessy and Laszlo Jeki were elected as deputy secretary generals.

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BRIEFS

NEW COMPUTER, ELECTRONICS ASSOCIATION--A research and development institute, the Computer Technology Coordinating Institute [SZKI] and the Communications Technology Cooperative [HT] have recently signed an agreement to become an association to be known by the acronym, FET - ES. Under the terms of association the SZKI will develop programs for HT equipment. Actually, the cooperation has been in process for several years and has produced the picture processing system displayed at the Budapest Fair. The association plans to continue work on picture processing. It will also design printed circuits, computerize and store the designs and make them retrievable on a CT. The outfit will also collaborate in preparing programs for NC [numerical control] and work in the field of remote data processing. To make their collaboration operational and to harmonize economic matters, SZKI and HT plan to establish a joint organ. [Text] [Budapest SZAMITASTECHNIKA in Hungarian Nos 7-8 Jul-Aug 81 p 1]

CENTRAL SCIENCE POLICY COMMITTEE--A committee to consist of members of the National Presidium of the MTESZ [Federation of Technical and Natural Science Association] and members of the associations is to be set up as an advisory, coordinating and suggestion body. Doctor Tibor Vamos, academician, has been made chairman of the committee. [Text] [Budapest SZAMITASTECHNIKA in Hungarian Nos 7-8 Jul-Aug 81 p 1]

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END

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9 December 1981

East Europe Report

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No. 724

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PLANS FOR LONG-TERM DEVELOPMENT OF AUTOMATION DEVICES, SYSTEMS

Budapest MERES ES AUTOMATIKA in Hungarian Vol 29 No 9, 1981 pp 325-329

[Article by Istvan Littvai, deputy minister of industry, Budapest; text of the author's paper delivered at the Automation '81 conference held in Budapest 22-24 Apr 1981]

[Text] The paper summarizes the advancements of the last five years in the development and manufacture of automated control-engineering equipment and systems, and analyzes the problems involved. It reviews the status of the domestic applications of control systems, and discusses their prospects. It analyzes the major research and development tasks of the subject area, and their limitations. It describes the concepts of the development and manufacture of automation equipment and systems during the period covered by the Sixth Five-Year Plan.

Hungarian automation experts have been meeting regularly for a long time. The Scientific Association of Metrology and Automation administers this forum since the last 20 years or so, providing a forum where the representatives of the discipline -- researchers, developers, and manufacturers -- can meet, and can present and debate their achievements and problems.

Our present discussion takes place just about at the juncture of the Fifth and Sixth Five-Year Plans. This fact alone is reason enough for reviewing the work carried out during the period now ending and for outlining the concepts for the future.

Evaluating the work of the Fifth Five-Year Plan period, we must conclude that there has been a dynamic growth in the domestic manufacture of automation equipment and systems. The numerical values look very favorable.

Our Achievements

The output of the industry sector increased by approximately 65 percent between 1976 and 1980. The growth rate of export was higher than that of production, so that the export percentage became 40 percent by the end of the plan period. Insofar as the marketing structure is concerned, approximately 90 percent of the total production went to socialist markets.

Major investments in the fixed assets made the growth of production and marketing possible. It is a demonstrable fact that the value of the development expenditures in the industry sector between 1976 and 1980 is several times higher than that of the development expenditures during the preceding plan period.

Productivity has also increased, by approximately 40 percent between 1975 and 1980.

The production of the industry sector has been further concentrated. More than 55 percent of the output of automation equipment and systems is produced by three enterprises, namely the MMG [Measuring Instrument Works] Automation Factory, VILATI [Electrical Automation Institute], and VBKM [Electrical Equipment and Appliance Works]. Other major enterprises in the industry sector are the Precision Fittings Works, Ganz Electrical Works, Gamma Works, and the EMG [Electrical Measuring Instrument Works].

I wish to stress that the major enterprises and institutions of the industry dector have become significantly stronger.

As a result of developments made for the production of control equipment and systems for the Soviet gas and petroleum industry, MMG Automation Factory doubled its system-manufacturing capacity, so that it now has a major production potential even on the international scale.

The situation of VILATI has stabilized in recent years; the enterprise is in a better financial position and is now capable of taking an important part in the solution of automation problems, commensurate with its intellectual and technological potential.

There has been an internal structural modernization at VBKM — the High-Voltage Electronics Factory has been created — so that this enterprise can now produce more systems and adapt itself to the needs of the customers.

May I -- without claiming to provide full coverage -- mention a few solutions in the field of automation which may be regarded as outstanding even on the international scale.

The MMG Automation Factory has, among others, realized the telemechanical system of the central-Asian gas pipeline system, further developed the control system of petroleum pumping stations, improved the program-control and data-acquisition system of tank parks, developed the oil-measuring stations in cooperation with VEGYEPSZER [expansion unknown], and realized the control system of gas-lift exploitation.

By developing the computerized test bench for Diesel engines for the automobile factory in Kama, VILATI has created an engineering achievement which is significant even on the international scale. In my opinion, the accomplishments in the field of traffic-control systems -- particularly Type FB 416, which operates autonomously in a traffic-dependent manner -- are particularly significant.

Among the accomplishments of VBKM, special mention should be made of the shaft-transport systems for mines, for example the system recently commissioned in the Markushegy mine, control and guidance systems for rolling mills, and light-orientation system development. Insofar as the latter are concerned, special mention may be made of the control system for the matrix panel of the Moscow Olympic Stadium, which is a video-control system.

Some of the achievements of the relevant academic institutions deserve special mention since they are significant even on the international scale.

The machine-tool control system "Dialog" broke through the embargo limitations. It was developed at MTA-SZTAKI [Computer Technology and Automation Institute of the Hungarian Academy of Sciences].

The work carried out in the development of integrated manufacturing systems opened up an entirely new approach.

KFKI [Central Physics Research Institute] developed approximately 50 complete technological process-control systems on the basis of the CAMAC system for specific industrial applications. Among these, special mention should be made of the computerized process-monitoring systems for Duna Thermal Power Plant and Tisza Thermal Power Plant, the control system for point filling in Leninvaros, and the technological process-control system of the alumina factory in Almasfuzito.

It is also a fact that the domestic needs for technological control systems have been fully met in certain industry sectors during the past few years.

KFKI can report achievements that satisfied the users in several areas, such as certain gas- and petroleum-technological processes for MMG Automation Factory; Gamma Works met domestic user needs in the field of water management. At the same time, there has been no domestic activity in a number of industry sectors (because of lack of expertise, R/D capacity, or other reasons), so that we had to resort to importation in some areas where this should not have been necessary for technological reasons.

The situation is very favorable insofar as certain domestic developments for marketing in socialist countries are concerned; they involve primarily automated technological systems.

However, to be able to assess these developments in a realistic manner, we must also consider the fact that they involved the use of much equipment purchased from capitalist sources, the procurement of licences, and the cooperative efforts with capitalist entities.

Our Problems

While we have achievements to report, we must also note the fact that we also have serious problems in some areas.

We have not been able to significantly increase our export volume of automation equipment and systems to capitalist markets. The fact that in spite of the efforts of our enterprises we were unable to achieve breakthroughs in this field is attributable to the technological level of our products as well as to the quality of our engineering and commercial services. It is also evident that our purchases of relevant licences and know-how failed to produce major advances, and that our cooperative efforts with capitalist entities are at a relatively low level.

In my opinion, it is a basic fact that there is a major lack of coordination in the field of research and development, and that there is much duplication of effort. The development cooperation among the leading enterprises of the industry sector is not as good as it should be, and it looks that there are problems in the relationships among research institutions and industrial enterprises. It is also evident that, apart from some innovation concepts, the innovative network is scattered. Also, industrial implementation of some major research achievements originating from domestic institutions has been delayed or not achieved.

We need better cooperation among the enterprises and the research institutions, and quick measures for achieving this. This is primarily the task of the technological teams of the institutions and enterprises concerned. Use must be made of the accomplishments of other enterprises in related fields.

Production cooperation has been realized in the industry sector, but only at a relatively low level. Basically, each and every enterprise tries to manufacture the full range of equipment and systems required for the solution of automation problems, instead of implementing a division of the work and sensible assignment of the tasks to individual enterprises. Yet this would make production much more efficient.

Everyone knows, for example, that there are many microprocessor-based control systems. Equipment made by individual enterprises such as the RPT by Videoton, the AM SAM-80 by MMG, and the products of Gamma, VBKM, SZTAKI, KFKI, VEIKI [Electric Power Industry Research Institute], MIKI [Instrument Industry Research Institute], and BME [Budapest Technical University] is intended to serve the same purpose but the individual products are based on different components or represent small series and different engineering levels. The situation is similar in the area of PLC's.

The situation is even worse insofar as subassemblies (for example power supplies, central processor units, or modems) are concerned. And if we look at the multitude of components used, the picture becomes even more dismal.

Earlier noted duplications and disarrays in the field of the manufacture of automation equipment and systems are evident at a time when there is a dynamic growth of the industry sector, international cooperation, and universal standardization evident elsewhere.

Analyzing the duplications that exist, we often encounter the argument that appropriate enterprise specialization, taking into consideration the special needs of the various users, has been achieved by the individual enterprises, whereby a given enterprise assumes the responsibility of meeting the needs of a given technological sector insofar as the automation of technological processes is concerned.

This is indeed true insofar as the technology is concerned. The MMG Automation Factory stands ready to serve the needs of the gas and petroleum industry, Gamma Works operates basically in the areas of water management and nuclear power plants, VILATI solves automation problems for the metallurgical, chemical, and automobile industries, VBKM deals with shaft-transport equipment for mines and light displays, and KFKI works on the automation of power-plant processes. However, there is very much duplication behind this facade of branch-oriented technical specialization since diverse technological processes can generally be controlled by equipment of similar design and construction.

Without attempting to analyze this problem in full detail, the foregoing indicates clearly the most important tasks we must handle in the future. Basically, we must establish an organized production cooperation based on closely coordinated research and development. With this we must achieve a concentration of the R/D capabilities and a better utilization of the productive capabilities -- meaning increased efficiency. When these problems are solved, our potential of equipment and system production will be significantly increased.

Applications

It is very important to increase the production capacity of automation equipment since the increased automation of certain production and service processes -- which is important for the national economy -- can be realized only parallel with the development of domestic manufacture of automation equipment.

It is a known fact that the rate of automation of technological processes in Hungary during recent years fell behind that of developed industrialized countries. According to our experience, the level of automation of some of our recent facilities -- primarily certain major state investment projects -- is of a high level. These facilities are modern and efficient. However, most investments based on enterprise decisions and many reconstructions are automated only at a low level. A statistical analysis of the industrial investments made during the Fifth Five-Year Plan period indicates that whereas the degree of automation in investment projects covered by state decisions is 5.9 percent, the corresponding degree in enterprise investments is at a much lower level, namely 4.3 percent.

It is evident, nonetheless, that the level of automation of the fixed investments of industry has increased -- albeit at a quite low rate -- over the long range. This is confirmed by the fact that the so-called automation content of the fixed equipment of industry increased from 5.5 percent to 7.2 percent between 1965 and 1980.

Needless to say, there are major differences in the level of automation between the individual industry sectors. Certain power plants, the electric power distribution system, transportation of gas and petroleum, storage and distribution of gaseous and liquid fuel, and major chemical-industry facilities feature a high level of automation, as required by the technological processes involved.

Insofar as industry as a whole is concerned, however, there is a major need -- as I mentioned earlier -- for increasing the level of automation. This is confirmed by the analysis made for the National Planning Bureau by the OMFB [National Technical Development Committee] in 1979-1980. As all experts know, the OMFB issued a series of studies under the title "Production Development of Automated Technological Control Systems" analyzing the automation concepts of the individual industry sectors for the Sixth Five-Year Plan period. The conclusions of the studies indicate that there are plans for above-average automation in the petroleum industry, the electric power industry, the chemical and petrochemical industries, the metallurgical and machine-manufacturing industries, and the light industry during this plan period, and that increased efforts are also planned for agriculture and the food industry.

Since our resources for investment are limited, it is likely that these plans will have to be curtailed. Nonetheless, we must endeavor to ensure that the need for the most economical utilization of the investment resources does not result in the fact that the instrumentation and automation of new investments are kept at a low level. It is essential that all facilities are automated at the required level for the products and production methods involved.

The Tasks Facing Us

The question emerges that with the major domestic needs facing us what tasks should be set for the development of the domestic manufacture of automation equipment and systems. I would like to stress that -- in line with our past development-policy goals -- our industry sector will continue to be export-oriented for technological, commercial, and economic reasons. It is also necessary for the enterprises and institutions of the industry sector to pay increased attention to the domestic needs during the Sixth Five-Year Plan period.

Among the domestic needs, we must feature the equipment and systems required for the machinery, technological equipment, and complete factories made by the domestic industry. These must be properly automated if our industry is to be competitive. This is basically a background activity.

When meeting the domestic needs, we must make full use of the advantages of international cooperation, and we must realize that certain needs will have to be met with imports. There is no other way for modernizing the production structure and for increasing our efficiency.

May I now outline briefly those requirements which the domestic users and our foreign partners impose on control-engineering equipment and systems.

Decentralized multilevel systems with hierarchical structure are required generally for extensive and complex technological process control.

Another important user need is the solution of the control problems of less complex and locally concentrated technological processes with autonomous electronic control systems of adequate intelligence and not with conventional instrumentation.

A basic user need is the use of sensors which are adequately accurate, can operate under various ambient conditions, and consume little power. It is equally important to expand the range of the actuating equipment.

The systems must be increasingly dependable, they must be easy to maintain, and they must be available at relatively short notice.

Research/Development Program

The Ministry of Industry and the OMFB decided to set up a departmental program for the Sixth Five-Year Plan period. This program takes into consideration the above-mentioned requirements, the major economic significance of automation, the major international development trends, and the expected major advancements in the industry sector. This program is designated as the "Research and Development Program for Automation Equipment and Systems."

The departmental program is based on the OKKFT [expansion unknown] program developed earlier by the KGM [Ministry of Metallurgy and Machine Manufacture], the OMFB, and the MTA [Hungarian Academy of Sciences].

The technological/economic goal of the program is to promote the research, development, manufacture, and marketing of key equipment for the realization of the automation systems for extensive and/or complex technological objects and for local autonomous control equipment, as well as to develop systems from the equipment thus realized. The program must be carried out with the direct data-transmission capabilities available, and must make it possible to facilitate the implementation of the results in actual products.

When developing the equipment basis, it is advisable to assign priority to the specifically featured applications, irrespective of the application fields of the equipment base. In order to realize this goal, we must take the steps required, thereby ensuring that during the Sixth Five-Year Plan period we not only create the foundation for the implementation of the export goals of the industry sector but also advance significantly toward meeting the most important automation needs of the national economy, so that major savings in the import volume from capitalist sources can be realized. We shall meet the presently known needs -- hopefully at a 60-65 percent proportion -- in the petroleum and natural gas industry, the conventional nuclear-power industry, water management, agriculture, and food industry, and we shall prepare ourselves for meeting our needs for automation equipment and systems during the Seventh Five-Year Plan period.

In addition, a product base will be established for "barter trade" with socialist and capitalist partners in the industry sector, and with international agreements we endeavor to ensure that we can meet the system delivery committments for the 1981-1985 period laid down in international agreements, making full use of the potentiality of cooperation with capitalist partners in terms of product base and intellectual background.

The program consists of two closely related and interdependent subprograms: a system subprogram and an equipment subprogram.

The strategic goal of the subprogram covering the process-control systems for automated technological processes is the solution of the research and development tasks required for expanding and upgrading the system deliveries.

In order to achieve this goal,

- we must create prototype systems in the selected application areas;
- we must develop a system technology for universal use;
- we must develop application-independent prototype systems and prototype systems adapted to individual applications on all three levels of system hierarchy;

- we must create reference systems based on modern system engineering and equipment.

In the equipment subprogram we define those research and development tasks which, when solved, will create a technological level and assortment ensuring that our planned system-delivery volume and relationships can be realized, primarily via system deliveries.

The goal of the subprogram -- as a means of the fulfilment of one of the strategic goals of the program -- is the creation of the technological and other requirements of the equipment base needed for the control-engineering systems in the selected application areas. Accordingly, from among the research and development tasks for the key equipment this is where we must establish the specific modern manufacturing-technology base from the R/D base.

During the plan period, we intend to facilitate the solution of the R/D tasks by domestic research and major licence procurement.

Successful accomplishment of the departmental program will increase the level of our automation equipment and system production by approximately 55-60 percent in the selected areas. Export to capitalist markets will increase approximately 2.5 to 3 fold by 1985. In addition to the quantifiable data, there are major non-quantifiable factors too, primarily in the areas of coordination of R/D activities and elimination of duplications. The major impact of the program will be felt during the Seventh Five-year Plan period.

The scope of the prototype systems to be created in the individual application areas will be established on a competition basis.

Sixty percent of the expenditures envisaged for the accomplishment of the departmental program will be expended for equipment, and 40 percent for system development.

Approximately half of the R/D expenditures will be covered from the enterprise development fund, and the rest from state allocations.

At the present time, the preparatory work for implementation is in progress; the negotiations involving the participation of the MTA are not completed either.

Summary

To sum up the development considerations for the domestic manufacture of automation equipment and systems, we may state that the growth rate of this industry sector will be above the average of the growth rate of industry as a whole in the next ten years.

Realistically, we may assume that the annual growth rate of production will be 7-7.5 percent. The marketing structure will be modified since we may envisage that the growth rate of socialist export will be less than the growth rate of production, while the sales volume to capitalist markets will increase 2 to 2.5 fold during five years to implement the increase in the percentage of deliveries of the industry sector to capitalist markets.

In addition to the export tasks, however, we must pay attention to the solution of the domestic automation tasks, not only in terms of new facilities but also in terms of reconstructions.

For the accomplishment of these tasks it is essential that the leading enterprises and institutions cooperate better than before more broadly and more efficiently in all areas, including research and development, production, marketing, and even maintenance.

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OBSTACLES TO TECHNICAL PROGRESS VIEWED

Budapest MUSZAKI ELET in Hungarian 4 Sep 81 p 1

[Article by Dr Andras Roth: "The Technological Gap; Retrograde Forces"]

[Text] Despite the significant efforts and achievement of the past 15 years there has not been a decrease in the technological gap between the machine industry of our homeland and the majority of the developed capitalist countries or the most developed socialist countries.

Outstanding among the causes of this are the deficiencies on a social scale of the division of labor--specialization and cooperation--and the inconsistencies of investment and development policy.

Frequently the narrowness of the investment-development funds are blamed for our technological backwardness and such voices have strengthened especially in recent years when accumulation funds really did decrease. The data pertaining to the age of the machine part of the machine industry refute this opinion. It can be demonstrated that the average age of the domestic machine park is lower than that of developed capitalist countries (for example, the United States). Investment funds must be used more deliberate, with a rational policy, to reduce the technological gap.

In addition we must create those technical-economic conditions within the frameworks of which there can be the necessary concentration of material assets, the development of modern manufacturing systems, which will ultimately make possible an improvement in the situation of the entire machine industry (and not only that of the enterprise creating these conditions).

In 1971 the CIRP [expansion unknown] published a forecast, prepared with the Delphi method, concerning the development of machine manufacturing technology up to the turn of the century. At the time the OMFB [National Technical Development Committee] published this prognosis in the Hungarian language as well. After almost 10 years the US Society of Technological Engineers (SME) has prepared a similar survey.

Recently the OMFB, within the framework of a study titled "Chief Directions of Development to be Expected in Current Machine Industry Manufacturing Systems and Material Separation Procedures," compared the technological development which took place in the 1970's with the prognosis of the CIRT [see above] taking into consideration the most important questions and answers of the new prognosis of the SME.

As a synthesis of the two prognoses the study outlines the chief trends of development which can be expected in the decade ahead. It compares the development which has taken place in the world at large with the domestic development and examines the extent to which our developmental ideas conincide with the most important international trends.

Sociotechnical Methods

According to the pronoses the ratios of prefabrication, parts manufacture and assembly which have developed in the most developed countries will not change substantially. But we must reckon with changes in the ratios and functions of certain procedures within these groups. Computer guidance--especially the use of microprocessors--is spreading to the area of larger scale, newer processes, including prefabrication. The ratio of cold and semi-hot forming is increasing among malleable forming procedures.

The productivity and reliability of traditional metal cutting and abrasive procedures and the quality and precision of parts produced is increasing significantly. Among non-traditional procedures there will be expanded use of tool independent solutions (laser, plasma, wire, planetary electrode, etc. methods).

The first automatic factories are appearing (Fujitsu, MUM, ICAM) and the number of integrated manufacturing systems is increasing--but at least in the first half of the decade--the emphasis in complex automation will shift in the direction of smaller integrated systems, consisting of 2-6 pieces of equipment. Measurement, inspection and quality control will increasingly become process control functions. There will be a great increase in the role of sensors serving to measure process characteristics, of automatic inspection and of closed cycle guidance feeding back through the processes. Adaptive process control will increase in general. Subsequent automation of certain processes--primarily with microprocessor control and pneumatic and hydraulic executive organs--offers great possibilities.

Determining and controlling the complex properties and optimal values of the working surfaces of machine parts and of surface strata--surface integrity--is assuming first order significance.

Sociotechnical methods are becoming dominant in assembly done by hand. The ratio and flexibility of automatic assembly are increasing significantly in assembly systems of both greater and lesser integration. Automated work-piece handling, especially the role and intelligence level of robots, will increase.

The elements which will determine machine industry development in the decade ahead are automation based on micro-electronic tools, the integration of manufacturing systems, designs and technologies which conserve material and energy, prefabrication technologies, and a swifter development and automation of work-piece handling, material movement and assembly.

Our domestic plans reflect and are adapting to these chief developmental trends. The OKKFT (National Medium Range Research and Development Plan) worked out for the development of machine manufacturing technology is also in harmony with the most important components of technological development in regard to technical content. But it is debatable whether this is true in regard to other programs (computer technology, micro-electronics, etc.) which influence technological development to a significant degree.

The domestic machine tool industry has not played its role in accordance with its strategic significance. Its product structure is modern--this is shown by the results achieved on the markets of developed countries too--but our industry is hardly getting those products of it which embody the higher technological level.

The machine tool industry is not one of the branches of the processing industry and it is not just one of the branches producing mass goods because it produces the production equipment and manufacturing tools used by the entire machine industry.

In a small country like ours these are important branches, "top industry," because to a very large extent they depend on the research and development achievements and make the greatest demands on the products and services of the background industry and on its own technology.

The Role of the Time Factor

The deficiencies of the interest system which should encourage cooperation have a retrograde, conservative effect on the manufacturers and users of semi-finished products and partial units. In general our enterprises act rationally, according to their own interests. But when they decide on some obsolete version of development it is frequently heard that this is the result of a lack of understanding, of an incorrect view. They especially charge the experts with an excessive preoccupation with metal cutting. Most often a more profound examination will prove that the decision corresponds to the interests of the enterprise. For example, in regard to a representative sample of parts it can be shown that while prefabrication with malleable forming is more economical, resulting in a 25 percent saving in material in the FRG, metal cutting is still cheaper for us, even with a 50 percent loss of material, because of the different cost structure. If we add to this the long delivery times and the well known deficiencies in contract discipline then it can be understood why they decide for metal cutting.

We can build the competitiveness of our machine industry only on satisfying, flexibly and with outstanding quality, in quantity and in workmanship, the swiftly changing demands. This requires a smooth innovation chain which subordinates every element to a swift and efficient transition. This pertains to the technology of every element: the technology of research (computerized research tools and instruments), computer-aided engineering design and documentation, and swift, flexible manufacturing and control systems alike.

We must modify the still generally used, purely financial criteria system in making developmental decisions; all the more so because such calculations are not even realistic due to the extraordinarily swift changes, even epochal changes, in markets, products and technologies. It may happen that by the time an investment is completed there is not even any longer a market demand for the planned product, in its original form. For this reason we should regard as primary in decision making the criteria of flexibility, technological convertibility and the ability to adapt to the market.

Technological development is held back by a regulator and incentive system which values only immediate export and does not value enterprises getting ready for export of producing products which take the place of imports. As a result of this it happens that we export some product and then import a product of similar performance and similarly modern but which is much more expensive than the export.

Critical Observations

According to the evaluation of the professional debate the analysis of the study is telling and draws correct conclusions in regard to the tasks of the domestic machine industry. The machine tool experts stressed the backwardness which exists in the manufacture of welded machine structures and which requires urgent measures, because this is equally important in order to save material and reduce transition times. They also pointed out that the ratio of rotating bodies and especially of cogwheels is decreasing in mechanical designs. Several underlined the significance of direct measurement systems, because these increase to an extraordinary degree the precision of the machines, and they stressed that inaccuracies can be corrected with software.

There was an opinion that following the listed developmental trends would be too expensive, that in the present situation these could not be realized as enterprise investments but only as state supported reconstruction. It also causes concern that there is a shortage of the technical workers needed to apply the technology, that training and further training are not keeping up with the needs of industry. A number of people referred to this sphere of questions in the course of the debate. They said that some of the engineers are leaving industry because the research jobs are more attractive. And only 30 percent of the existing engineers are doing technical work. It is striking that the number of applicants to engineering universities is decreasing, that the prestige of an engineering career has declined. These are phenomena the causes of which must be analyzed and the effect of which must be negated if the personnel conditions for development are to be created.

It was said that the medium range plans do not sufficiently reflect the automation tasks, the reason being that the attitude of industrial guidance is still primarily "mechanical" so the priority task is a "formation of awareness" and the OMFB must take part in this also.

It was decided that the essential findings of the study should be disseminated widely in every forum of the profession. In the future, care must be given to building the more important tasks into the industrial development conceptions and plans.

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MULTITERMINAL DATA RECORDING PROGRAM SYSTEM FOR THE VT20

Budapest SZAMITASTECHNIKA in Hungarian Sep 81 p 11

[Article by J. Bojta and A. Kiss]

[Text] The MTDS-80 was developed by the Computer Technology and Information Main Department of BOSCOOP along with the agricultural program packages already reported in the September issue of the magazine. The objective of the MTDS-80 development was to provide a simple and effective device for data input on VT20 computers, taking into account the machine's basic hardware and software characteristics. Using the MTDS-80, the records to be recorded can have different structures. The format of the records must be determined prior to the recording of data. The system records data parallel on several terminals. The recording of data can take place simultaneously at different work stations and even based on different record formats. In the process, the input, interrogation or modification mode can be optionally selected.

The system handles both index-sequential and sequential files. The files contain no special information; so it is possible to access, interrogate and modify files created through other means. Thus using the MTDS-80, the most common input and interrogation functions of the disk- and screen-oriented VT20 can be effectively performed. The operation of the system is simple and can be learned in a minimum time; the program packages can be introduced in a short time.

Use

The system is adapted to the basic software provided for the VT20 by Videoton, which includes the following:

- operating system (sequential file management, program loading, trace)
- REMAS macro assembler for INTEL 8080 processor
- DABAS index-sequential file manager
- BASIC interpreter
- Utility programs supporting earlier programs.

The single data recording program package which is suitable for the recording of sequential data files may be purchased from Videoton. At the present, the programming of the minicomputer, system organization and the processing of data can be based on these. The basis of data storing and data management is the DABAS index-sequential file manager by which the individual data files can be permanently stored even according to several categories, arranged by keys. The individual records can be quickly accessed based on the keys. Evaluating DABAS, we must take into account that accepting a new key into the file can take as long as one or two seconds, while reading out a key and its associated record takes about 0.03 seconds. As a result, sequential data collection and subsequent file management (such as the batch mode used on large computers) can significantly reduce system efficiency, since using this method neither the machine's dialog features nor its actual capacity can be fully used. Taking into account the relatively long time needed to create the file structure, an organization model is needed that permits the setting up of data files during the data recording process, since then the input time of a key (1-2 seconds) does not result in any extra time requirement. Checking data in this manner and comparing them with source data and arranging them, the computer can furnish up-to-date information already at the end of the input. That is, in the batch mode, this minicomputer can become prohibitively slow, while using this organization model it can be faster than a batch mode large computer.

The MTDS-80 effectively supports the above organization model, but at the same time allows the managing of sequential files.

General Structure

In order to use the system, we must first establish the input and disk write format of the desired records via the formatting language created for this purpose. Formatting determines the physical arrangement of the screen display and the location of the individual fields within the records written onto the disk. The established formats can be translated and placed in the program library by the format initiating program. The input to the translating program--the format--can be stored into any desired library file but can also be entered via the console. After determination and translation of the appropriate formats, the multitask system may be input and during its start-up the maximum number of disks and displays to be handled can be specified. Next, after logging on the system, the individual data stations can specify the disk, the file on the disk and the format desired for the purpose of data input, interrogation and modification. After completing the data handling task, with the selection of a new format and a new file, a new task can be started.

Brief Description of the Formatting Language

The formatting language allows determination on the screen of the texts aiding the data recording and the type and location of the data input field. Information even from several screens can be handled. The formatting language distinguishes two types of commands.

- Text printing from a given coordinate

It causes the desired character series to appear starting from the specified row and column of the screen. At the beginning of the recording of the records, the entire text desired on the first screen is printed out.

- Data input instruction

The input field's definition establishes the length and type of the field starting from a given row and column of the screen. At the beginning of the recording of the records, specified initial values (or in their absence) periods are written in place of the individual fields, indicating the total number of characters specified. After this, the inputting of data in the fields can take place according to the sequence determined by the format. The sequence of the fields within the records written on the disk is also determined by the format. The system distinguishes numerica and alphanumeric fields, but further checking, displaying and data input tasks can be specified for the individual fields. For example: setting of initial values; right justification following input; checking of a number entered in a field to determine whether it falls within a specified range; automatic field copying; suppression of leading zeros of numbers during display; alphabetic field only; inputting of floating point BASIC constants; assembly subroutine call.

It may be necessary within the record to reserve space in advance for certain fields without immediately using them, or we may not want to display all record fields on the screen. To this end, we can define one or more invisible data fields in the format. During recording, the system accepts only defined characters into the fields, which offers the possibility of recording only syntactically correct records.

The system also offers the possibility of performing special semantic and syntactic checking (e.g., CDV checking, comparison with source data). These checks and arithmetic examinations can be realized by assembly subroutines, which can be called from the format. For each field, an assembly subroutine can be specified that is called by the system following data input to the field. These permit the generation of certain fields of the record by a program. The system processes the assembly program associated with the format together with the format, completely automatically. It stores the recorded fields (the record) until the recording of the entire record is completed.

Index-Sequential Files

These are generated by the system on the VT20 DABAS file manager. When activating the screen, we have to specify the disk and its key file we want to use to perform the data handling tasks. Following this, the system reads in the key length associated with the appropriate key file and perceives the first key-length character of the record as the key of the record. The record's further characters end up on the data sectors. During the chaining of the data sectors, the MTDS-80 sets up the record structure also used by VT20 BASIC; so the records recorded by the multiterminal system can be read in without any problem from any BASIC program. (The maximum data record length is 32,512 bytes.)

Sequential File Management

The system does not limit the data record length; their size is only limited by the size of storage. The system generates and manages the sequential files by the file manager of the VT20 operating system. The end-of-record sign possibly located at the end of the individual records can be selected during the activation of the data recording work station, or alternatively the records can be written onto the disk without any separating sign.

Data Protection

The recorded data is written onto the disks record by record. The sequential files are closed by the system by each record; thus we can ensure with high probability that in a power failure or during a sudden equipment failure only the record just being recorded is lost.

9901
CSO: 2502/7

SPECIFICATIONS OF REMIX ELECTRONIC PRODUCTS

Budapest HIRADASTECHNIKA in Hungarian Vol 32 No 8, 1981 pp 317-318

[Unattributed article from REMIX Radio-Engineering Works, Budapest]

[Text] W9004, W9045, and W9107 Resistor Networks

Recommended Uses

Resistor networks may be used in all areas of modern exportable products made by the electronics industry, wherever individual film resistors of more than two units have been used earlier.

The technological advantages of resistor networks are easier installation, automatability of installation, and favorable technological characteristics (such as good temperature resistance, small dimensions, reliability, insulability). Stock management is an economic benefit of their use.

Construction

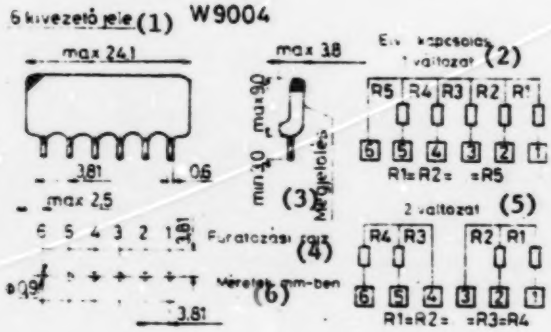
As the schematic diagram illustrates, resistor networks consist of individual resistors applied on ceramic wafers by means of thick-layer technology. The external contacts are made by means of dependable soft soldering. Protection is provided by plastic capsulation.

Technical Specifications

Nominal resistivity: As stated in the table below.
Resistivity constancy: ±5 percent
Nominal loadability (per resistor): 160 mW
Temperature coefficient (between 25°C and 125°C): max. $\pm 500 \cdot 10^{-6}$/K

Lifetime

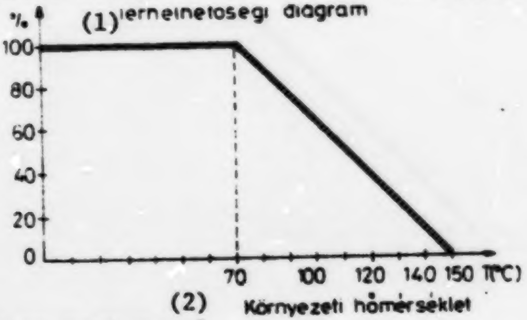
(2000 hours, 70°C, cyclic loading)
maximum permitted dR/R: max. ±3 percent
Key number: 0/125/10


6 kivezető jele (1)
W9004
max 24,1
3,81
0,6
max 2,5
max 3,8
max 9,0
min 3,0
(3)
Megjelölés
Ev. kapcsolás
1 változat (2)
R5
R4
R3
R2
R1
6
5
4
3
2
1
R1=R2= =R5
2 változat (5)
R4
R3
R2
R1
R1=R2= =R3=R4
6 5 4 3 2 1
3,81
Furatozási rajz
(4)
⌀0,9
Méretek mm-ben
(6)
3,81

Key:
1. Coding for six external contacts
2. Schematic diagram, Version 1
3. Designation
4. Drilling diagram
5. Version 2
6. Dimensions in millimeters

Névleges (1)		Változat (4)	Névleges (1)		Változat (4)
ellen-állás [Ω] (2)	feszült-ség [V₋] (3)		ellen-állás [kΩ] (2)	feszült-ség [V₋] (3)	
33	2,3	2	1,2	14	1
47	2,8		2,2	19	
150	4,9	1	3,9	25	
220	5,9		8,2	36	
560	9,5		33,0	73	

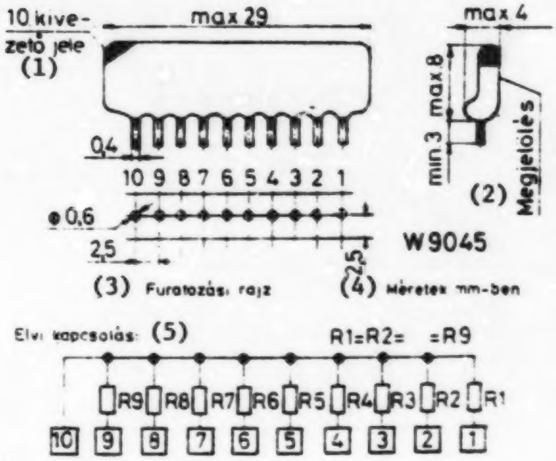
Key:
1. Nominal
2. Resistivity
3. Voltage
4. Version



[Key on next page]

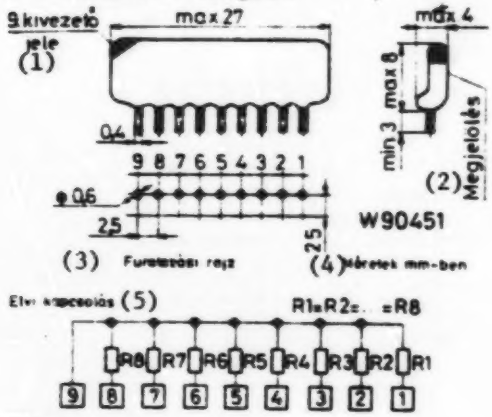
[Key for diagram on preceding page]

1. Loadability diagram
2. Ambient temperature


10 kive-
zető jele
(1)
max 29
max 4
max 8
min 3
Megjelölés
(2)
0,4
10 9 8 7 6 5 4 3 2 1
ϕ 0,6
2,5
2,5
W9045
(3) Furatozási rajz
(4) Méretek mm-ben
Elvi kapcsolás: (5)
R1=R2= =R9
R9 R8 R7 R6 R5 R4 R3 R2 R1
10 9 8 7 6 5 4 3 2 1

Key:

1. Coding for 10 external contacts
2. Designation
3. Drilling diagram
4. Dimensions in millimeters
5. Schematic diagram


9 kivezető
jele
(1)
max 27
max 4
max 8
min 3
Megjelölés
(2)
0,4
9 8 7 6 5 4 3 2 1
ϕ 0,6
2,5
2,5
W90451
(3) Furatozási rajz
(4) Méretek mm-ben
Elvi kapcsolás (5)
R1=R2= =R8
R8 R7 R6 R5 R4 R3 R2 R1
9 8 7 6 5 4 3 2 1

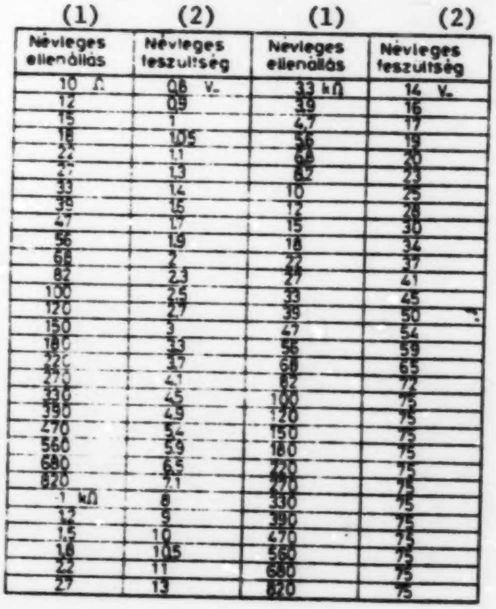
[Key on next page]

[Key for drawing on preceding page]

1. Coding for nine external contacts
2. Designation
3. Drilling diagram
4. Dimensions in millimeters
5. Schematic diagram

Technical specifications

Nominal resistivity: According to Series E12
Resistivity constancy: ±5 percent
Loadability (per resistor): 62.5 mW
Temperature coefficient: max. $\pm 500 \cdot 10^{-6}$/K
Noise voltage:
- R_n below 10 kiloohms: max. 3 microvolts per volt
- R_n between 10 and 470 kiloohms: max. 10 microvolts per volt
- R_n above 470 kiloohms: max. 50 microvolts per volt

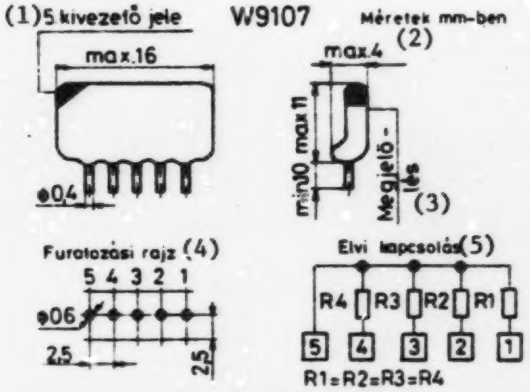


(1) Névleges ellenállás	(2) Névleges feszültség	(1) Névleges ellenállás	(2) Névleges feszültség
10 Ω	0,8 V₋	3,3 kΩ	14 V₋
12	0,9	3,9	16
15	1	4,7	17
18	1,05	5,6	19
22	1,1	6,8	20
27	1,3	8,2	23
33	1,4	10	25
39	1,5	12	28
47	1,7	15	30
56	1,9	18	34
68	2	22	37
82	2,3	27	41
100	2,5	33	45
120	2,7	39	50
150	3	47	54
180	3,3	56	59
220	3,7	68	65
270	4,1	82	72
330	4,5	100	75
390	4,9	120	75
470	5,4	150	75
560	5,9	180	75
680	6,5	220	75
820	7,1	270	75
1 kΩ	8	330	75
1,2	9	390	75
1,5	10	470	75
1,8	10,5	560	75
2,2	11	680	75
2,7	13	820	75

Key:
1. Nominal resistivity
2. Nominal voltage

Lifetime

(2000 hours, 70°C, 62.5 mW)
Permissible dR/R): max. ±% percent
Key number: 10/070/21


(1)5 kivezető jele
W9107
Méretek mm-ben
(2)
max.16
max.4
ϕ0,4
min10 max11
Megjelö-lés
(3)
Furatozási rajz (4)
5 4 3 2 1
ϕ06
2,5
2,5
Elvi kapcsolás(5)
R4
R3
R2
R1
5
4
3
2
1
R1=R2=R3=R4

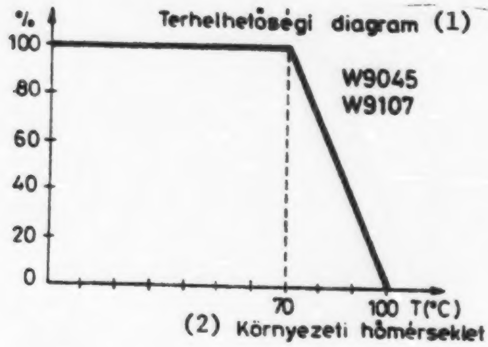
Key:
1. Coding for five external contacts
2. Dimensions in millimeters
3. Designation
4. Drilling diagram
5. Schematic diagram

Technical Specifications

Nominal resistivity: 15 megohms
Resistivity constancy: ±20 percent
Operating voltage: 500 VDC
Testing time: 1 minute
Test voltage: 1200 VAC or VDC
Temperature coefficient: max. $\pm 500 \cdot 10^{-6}$/K
Noise voltage: max. 15 microvolts per volt

Lifetime

(1000 hours, 70°C, 500 VAC)
Permissible dR/R: max. ±5 percent
Key number: 10/070.21



Key: 1. Loadability diagram
2. Ambient temperature

The above components are marketed by ELEKTROMODUL. A catalog is available upon request. Our Main Commercial Department (telephone: 573-033) looks forward to your enquiries and is ready to be at your service.

REMIX Radio-Engineering Enterprise,
Budapest X,
Pataki Ter 20.

2542
CSO: 2502

POLAND

POLISH ACADEMY OF SCIENCE ACTIVITIES, PERSONNEL

Warsaw NAUKA POLSKA in Polish No 7-8, Jul-Aug 81 pp 129-140

[Article: "News from the Polish Scientific Movement"]

[Excerpt] Meeting of Historians from Poland and the FRG

Through the efforts of the Polish Historical Society and the Association of German Historians, the second historians' conference was presented and was devoted to an exchange of views in the area of the economic, social, and cultural history of Central Europe during the early modern period, that is, from the 16th Century to the 17th Century. It was held 17-20 March 1981 in Torun.

German scholars, headed by Prof Christian Meier, chairman of the Association of German Historians, represented academic facilities in Munich, Saarbrucken, Tubingem, Bielefeld, Freiburg, Bohum, Giessen, Kassel, and the University in West Berlin. Polish scholars headed by Prof Marian Biskup, member of the presidium of the main administration of the Polish Historical Society, represented the universities of Gdansk, Krakow, Poznan, Warsaw, Wroclaw, and Torun.

Fifteen papers and communiques were presented, and in them the socioeconomic problems of Poland and Germany in the 16th and 17th Centuries were brought to light.

At the end of the conference, the participants visited castles of the Chelm area.

Polish Issues in the Research of the GDR and FRG

A conference devoted to Polish problems in the scientific research of the GDR and FRG was held at the Western Institute in Poznan on 23 March 1981.

During the deliberations there was an analysis of the research conducted in the two German states concerning the policy of Germanization in the Polish lands up to 1914, the impact of Polish affairs in the historiography of the GDR and FRG during World War I and the period between the wars, and the reflection of our country's political, economic, cultural, and social problems in GDR and FRG scientific research following World War II.

Transitions in the Political System in People's Poland

The annual congress of the Polish Society of Political Sciences was held on 28-29 April 1981 at the University of Warsaw. About 100 political scientists from all over the country attended. The main theme of the congress consisted of the problematics of changes in the political system in Poland.

Prof Artur Bodnar, deputy chairman of the society opened the deliberations. Among other things, he stated that the results of this congress and the documents from the deliberations of the previous session concerning the policy and administration of the national economy would be the basis for the synthetic report which the society was drafting on the mechanisms of leadership and its distortions which had led to the August 1980 crisis. In addition, Prof Bodnar mentioned that in August 1980 the society had appealed to the leadership through a memorandum in which the need to conduct reforms in the country and, especially, to respect the processes of the democratization of life was emphasized.

The presentations of scientific employees focused on an analysis of the major phenomena and problems of political and social life. For example, Prof Jerzy J. Wiatr presented a paper entitled "Lesson of past crises." Prof Kazimierz Podoski talked about the political consequences of errors in social policy. Prof Czeslaw Mojsiewicz discussed the issues of political leadership, and Prof Henryk Groszyk and Dr Marek Zmigrodzi presented the problem of allied parties in the Polish political system.

Development of Library Science in Socialist Countries

The Tenth Conference of Library Department Directors in ministries of culture and national libraries in socialist countries was held in Warsaw on 5-8 May 1981. Representatives from Bulgaria, Czechoslovakia, Poland, the GDR, Romania, Hungary, Vietnam, and the Soviet Union attended.

During the deliberations information and experience were presented concerning the development of library science in the various countries, and there was a review along with an assessment of cooperation among libraries in the socialist countries during the past 2 years, that is, since the ninth conference, which was held in Berlin. Representatives of the various delegations presented the directions of library development in their countries as they projected them for 1981-1985.

History of the Workers' Movement in Poland

On 8 May 1981 a meeting of historians from various scientific centers in the country was held at the WSNS Institute of the Workers' Movement of the PZPR Central Committee. It was devoted to the history of the workers' movement in People's Poland. Alongside the historians interested in the history of the PPR, PPS, and PZPR, there were also historians of the workers' movement of the Democratic Party and of the vocational movement. The first meeting of this type was held in June of 1979. At that time there was a thorough discussion of methodological and methodical problems of regional research.

The discussion was based on a paper by Prof Bronislaw Pasierb of the University of Wroclaw. He discussed the dilemmas of historians interested in modern history. He pointed out the contribution and shortcomings of regional history, and mentioned the need to deepen research in the direction of the presentation of all aspects of history, including those which have been silenced in the past or not the subject of scientific interest. Twenty people took the floor in the discussion.

The Problem of Teacher Training

An all-Polish scientific meeting devoted to the issue of the training of teachers in institutions of higher education was held on 15-16 May 1981 in Krakow.

Scientific employees who took part in the session discussed the new concept of teacher training developed by the ministry of science, higher education, and technology. Minister of Education and Upbringing Boleslaw Faron also took part in the deliberations.

The Significance of National Education

A general meeting of the Scientific Council of the Main Administration of the Society for Universal Education devoted to the significance of historical education in the upbringing of the society was held in Warsaw on 26-27 May 1981.

The agenda included the following papers: "Relics from the culture of the nobility in contemporary culture" by Prof Janusz Tazbir, "Teaching history in the Polish school" by Prof Marian Marek Drozdowski, and "Society, history, myths" by Prof Janusz Zarnowski.

Polar Symposium

The Institute of Geography of the Silesian University and the Polar Club of the Polish Geographic Society sponsored the Eighth Polar Symposium, which was held on 27-29 April 1981 in Katowice, attended by specialists who are engaged in research on polar countries, the arctic and antarctic, in all the scientific facilities in Poland and several countries of Europe.

In keeping with tradition, the symposium was linked to the Polar Club's congress, which currently has about 400 members.

During the symposium there was a presentation of results of research already published in a special two-volume work containing scientific communiques and papers, and reports on the latest expeditions, along with summaries in English. In addition, the organization of polar research in 1982 was also on the agenda.

"Warsaw Confrontations 81"

On 23-29 April 1981 in Warsaw, the Warsaw Branch of the Association of Polish Architects sponsored an international symposium called "Warsaw Confrontations 81," which was devoted to the conceptualization of a programmed regional planning of the environment of the valley of the Vistula in the Gory Kalwarii region. Author groups from Belgrade, Berlin, Budapest, Helsinki, Moscow, Prague, and Sofia and three Warsaw groups participated in the symposium.

"Warsaw Confrontations 81" was the fourth meeting of architects from several countries coming together on a given topic. The meetings are an opportunity not only to exchange views but also to advance concrete proposals for solutions on various subjects. The previous meeting, held in 1978, was devoted to the question of a one-day holiday for a city of 2 million, the issue of a residential neighborhood on the Geclaw, and the subject of the Warsaw Scientific Group in Siekierki.

Application of Electronic Computer Technology

The 16th Training Conference of the Diebold European Research Program, an advisory organization in the field of computer applications, was held on 19-20 May 1981 in Gdansk.

The deliberations were devoted, for example, to a discussion of the experience of the advanced European countries in the realm of information services and the use of information science in large economic organizations. In addition, there was a discussion on the issues of coordinating the development of information science and its applications in Poland in 1981-1985.

Natural-Science Foundations for the Development of Agriculture

A conference devoted to a discussion of the natural sciences as a basis for the development of agriculture and farming in rural areas was held in Poznan on 7-8 April 1981. It was sponsored by the agricultural biology department of the Polish Academy of Sciences.

Representatives of the largest research facilities in the realm of this group of sciences discussed, among other things, the impact of the economy on rural areas, the protection of the environment, and environmental threat resulting from the intensification of agricultural production.

A great deal of attention was devoted to the principles of ecological prevention of diseases related to the adverse impact of intensifying cultivation of the land, a research program in the realm of the BIGLEB computerized information system, and a program for the development of ecological agriculture in the areas bordering on the Wielkopolski National Park.

At the end of the conference, those attending visited the PAN department of agricultural biology and became acquainted with the facility' activities.

Miscellany: In Memory of Polish Scholars

On the first anniversary of the death of regular member of PAN Wladyslaw Tatarkiewicz (died 4 April 1980) the Institute of Philosophy of the University of Warsaw held a scientific meeting on 3 April devoted to the commemoration of this great humanist, philosopher, and aesthetician.

His life and creativity were discussed by his friends and students: corresponding member of PAN Jan Bialostocki, Prof Alicja Kuczynska, Prof Jerzy Pelc, and Docent Dr Krystyna Zwolinska. Piotr Pawlowski, an actor from the Atheneum Theater, read excerpts from the works of Prof Tatarkiewicz.

An office in memory of Jozef Chalasinski has been set up in the historic palace in Rudno near Kolbiela, where the House of Polish and Polonia Memorabilia is located. Located here are a collection of the scientific works of Prof Jozef Chalasinski, regular member of PAN, who died in December 1979. The collection includes his entire scientific contribution, as well as all sorts of materials related to him personally. Also located here are his monographs, volumes with his treatises and prefaces, scientific articles published in periodicals, interviews, reviews of his works, and memorial materials dedicated to him. In addition, there are photographs, some manuscripts, letters, and notes made available by the family. There are also sets of scientific periodicals compiled, edited, or jointly edited by Prof Chalasinski.

Well-known sociologists and coworkers of Prof Chalasinski, PAN members Antonina Kloskowska, Wladyslaw Markiewicz, Stefan Nowakowski, and Jan Szczepanski are exercising scientific custody over the activity of the office in memory of Jozef Chalasinski. At the same time they are collaborating on the preparation of a multivoluminous subscription edition of Prof Chalasinski's collected works, which will be published by the People's Publishing Cooperative.

10790
CSO: 2602/5

DEVELOPMENT, DIRECT CONVERSION OF SOLAR ENERGY DISCUSSED

Warsaw POSTEPY FIZYKI in Polish No 4, Jul-Aug 81 pp 387-390

[Article by Zbigniew Werner: "Prospects for Utilizing Solar Energy in Poland via its Direct Conversion into Electric Energy"]

[Text] The modern world's energy crisis plus the increasing awareness of the inevitability of the depletion of its energy resources have caused increasing interest in the sun, the only practically inexhaustible source of energy for mankind.

Undoubtedly, of the many ways to use solar energy, its direct conversion in solar batteries utilizing the photovoltaic effect plays an all-important role. Research in this area is expanding quite rapidly worldwide, and solar batteries are receiving increasingly greater attention as a source of electric power, which at the turn of this century should substantially supplement other energy sources exploited to date.

According to those interested in this subject matter, the Polish Physics Society [PTF], in collaboration with the Nuclear Research Institute [IBJ] and the Institute of Physics [IF] of the Polish Academy of Sciences [PAN], organized a panel discussion on the use of solar power which was held on 24 September 1980 in Warsaw at the Institute of Experimental Physics [IFD] of Warsaw University [UW]. The following personally invited individuals participated in the panel discussion: Prof Julian Auleytner (IF PAN); Dr Eugeniusz Bandura of the PAN Solid-State Physics Institute [ZFCS] in Zabrze; Dr Eng Jerzy Chmielewski of the Ministry of Power Industry and Atomic Energy [MEiEA]; Dr Alfred Fiderkiewicz (MEiEA); Doc Robert Galazka (IF PAN); Dr Malgorzata Gorska (IF PAN); Doc Waclaw Jakubowski (IF PAN); Prof Jerzy Krzyzanowski of the PAN Institute of Fluid Flow Machinery in Gdansk [IMP PAN]; Prof Czeslaw Mejro; Doc Andrzej Opanowicz of the Institute of Physics at Lodz Polytechnic [IF PL]; Dr Hab Jerzy Piekoszewski (IBJ Swierk); Prof Henryk Rzewuski (IBJ Swierk); Prof Leonard Sosnowski (IFD UW and IF PAN); Doc Rajmund Trykozko (IF PAN); Prof Wieslaw Wardzynski (IF PAN); Dr Hab Zbigniew Werner (IBJ Swierk); Prof Zdzislaw Wilhelmi (IFD UW); and Prof Witold Zdanowicz (ZFCS PAN, Zabrze). The meeting was chaired by Prof Henryk Rzewuski.

The purpose of the meeting was to thoroughly discuss Poland's prospects for the use of solar energy by converting it directly into electric energy. The panel's program was divided into four sessions organized as follows: Session I, The Need to Introduce Solar Power into Poland; Session II, The Photovoltaic Research Problem; Session III, Direction of Photovoltaic Development Work in Poland; Session IV, Preparing the Panel's Conclusions.

The actual course of the discussions did not exactly follow the prepared program. Certain problems were barely touched upon, the discussion participants did not in general respond to some problems and other problems were discussed more extensively than planned for in the program.

In the first session Professor Mejro's talk was noteworthy. In it he painted a very somber picture of the prospects for developing Poland's power industry—conventional as well as nuclear--not only for the next 20-30 years, which must be considered when investigating the potential utilization of solar energy, but also for the immediate future. The lack of people willing to work in the mining industry, the demands for reduced work time and the immense materials-and-energy intensiveness of the coal mining process are barriers limiting the development of the conventional power industry. In turn, the development of the nuclear industry is threatened by the lack of high quality construction material. Professor Mejro also pointed out the difficulties associated with the mass production of electric energy from solar batteries because of the problems of storing this energy and of the high energy-intensiveness of the current solar battery manufacturing technology which to date have not been resolved satisfactorily.

In reply, Doctor Piekoszewski recounted the great progress now being made, especially in reducing the energy intensiveness of the mattery manufacturing process. He indicated that the new technologies are capable of reducing the energy intensiveness of this process by a whole order of magnitude.

During the second session Professor Zdanowicz's talk was very helpful. He spoke about the pioneering achievements of the Solid-State Physics Institute in Zabrze in the technology of silicon solar batteries, and the development of research on photovoltaic devices in Poland and the other CEMA countries. According to Professor Zdanowicz and representatives of other Polish institutions, such research, being conducted at several places and encompassing basic research as well as research on practical applications, concerns a wide gamut of photovoltaic material, from silicon to complex multi-component semiconductors. However, the funds currently allocated for these investigations are very modest.

The third session was devoted to an extensive discussion of the directions of the future expansion of photovoltaic research and work in Poland. The program presented by Doctor Piekoszewski, which is projected to be realized at the IBJ over the next 5 years, is noteworthy.* This program will include work on the latest and most energy-saving techniques for manufacturing silicon photovoltaic junctions using various modern methods. The concern here is about such technologies as ion implantation and formation of junctions with the aid of electron beam pulses. At present these methods augur the greatest hope from the viewpoint of the possibility of mass producing silicon solar batteries. According to Doctor Piekoszewski this program, in association with the ZFCS Zabrze program, now appears to be the quickest way to achieve the threshold of technical competence in the manufacture of solar batteries.

The representatives of the IF PAN, Warsaw Polytechnic and Lodz Polytechnic presented an interesting work program concerning other, future photovoltaic materials, above all thin-film materials. In their presentation, considering the immense potential possibility of obtaining high-performance and cheap solar batteries based on these materials, they emphasized the need for further basic research in this area.

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*In May 1981, based on a decision of the IBJ directorate in Swierk, the Photovoltaic Materials Laboratory under the direction of Doc Dr Hab Jerzy Piekoszewski, was formed. It will conduct research on modern methods for manufacturing photovoltaic batteries for future energy applications.

The final session was devoted to preparing the panel's conslusions. After a lengthy and exceptionally lively discussion, the panelists formulated the following conclusions:

1. the direct conversion of solar energy into electric energy in photovoltaic silicon batteries is one of the most promising areas of work on the use of solar energy;

2. an evaluation of the status of work all over the world on the technology of manufacturing silicon solar batteries that will permit the economically profitable production of electric energy under terrestial conditions indicates that during the next 5-10 years one can expect the mass production of electric energy via this method to become profitable;

3. the achievement of this goal will initiate the rapid development of this branch of technology, bringing vast economic and social benefits to those countries mastering it by alleviating raw-materials difficulties when producing electric energy, reducing ecological damage and exporting solar technology to developing countries;

4. in association with the above and considering the great progress being made in the technology of photovoltaic solar materials, the panelists believe research in this area should be intensified in Poland. This research should include: work on the technology of silicon and silicon batteries; basic research on other semiconductors that are of interest from the viewpoint of manufacturing solar batteries;

5. the goal of the research should be to master the latest technology for manufacturing photovoltaic components and their systems, and to train a group of specialists-practitioners who would form the embryo of a cadre for the photovoltaic materials and solar energy industry. One of the goals of this research also would be to conduct a technical-economic analysis of the conditions for the development of this industry;

6. in addition, it has been postulated that:

a) the solar energy theme should be popularized more extensively in scientific and technical periodicals as well as in popular science publications;

b) the subject of solar energy be introduced into the curriculum of the higher schools;

c) meetings dedicated to solar energy should be organized periodically in future years.

The panel's formulated conclusions were transmitted to institutions and ministries shaping scientific and technical policy in Poland, that is to the PAN; the Ministry of Science, Higher Education and Technology; the MEiEA; the Department of Science of the PZPR Central Committee; the directorate of the PR-8 government program; and to scientific, technical and popular science publications.

The discussion panel was the first of its type dedicated to Poland's energy prospects. It shows that there exists in Poland a group of scientists concerned with photovoltaic solar batteries and a large group of sympathizers in this area who are evaluating the need and importance of the conducted work. The research encompasses a number of themes, from work of a purely cognitive and basic nature to work aiming to develop technology that can be applied in practice.

Currently, the financial resources allocated for solar battery research are not large, but based on analogies of developments in this field in other countries, we expect resources to increase rapidly as progress in solar battery manufacturing technology advances and prospects for practical applications are realized. Also, it is expected that increasing numbers of scientists and practitioners will be attracted to the research program because of the attractiveness and topicality of its goals.

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END

JPRS 79669

15 December 1981

East Europe Report

SCIENTIFIC AFFAIRS

No. 725

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15 December 1981

EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 725

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INNOVATIONS ON EC 1025 COMPUTER SYSTEM DESCRIBED

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 4, 1981 pp 469-477

[Article by Eng Jozef Kloda, ZAVT [Data-Processing Equipment Research and Development Base] Concern and VUMS [Mathematical Machines Research Institute] Special Concern: "The Modernized EC 1025 Computer System"]

[Text] In the pages of our journal we have frequently acquainted our readers with research and development work on the EC 1025 computer system, its main characteristics and its success in international testing.

Meanwhile, the first EC 1025 computers have already been put into service, and it may be stated that they have fulfilled expectations and are becoming effective helpers, especially in the enterprises.

However, computer development continues, mainly in two ways:

1. Qualitative changes, which may be described as revolutionary, in computer philosophy, design concepts, basic computer components and the corresponding software structure; in these cases, we speak of changes of generation.

2. Quantitative changes, when computers of a given generation undergo innovations aimed primarily at increasing their productivity, improving their functional capabilities, expanding their range of applications and making their operation more efficient. These innovations frequently make use not only of findings from the operation of earlier systems, but as also of results of research and development work on other promising equipment.

The Data-Processing Research and Development Base [ZAVT Concern] and the Research Institute of Mathematical Machines special concern [VUMS] completed modernization work on the EC 1025 system in early 1980; the system will be offered to users in Czechoslovakia and abroad in the near future.

The direction of innovation work on the EC 1025 computer is a response to the requirements imposed on data-processing equipment by the gradual shift of the user base to more highly automated systems in the enterprise area, including superenterprise integration, and to the requirements of a number of special problem-oriented computer applications.

Fig. 1. The Innovated EC 1025 Computer

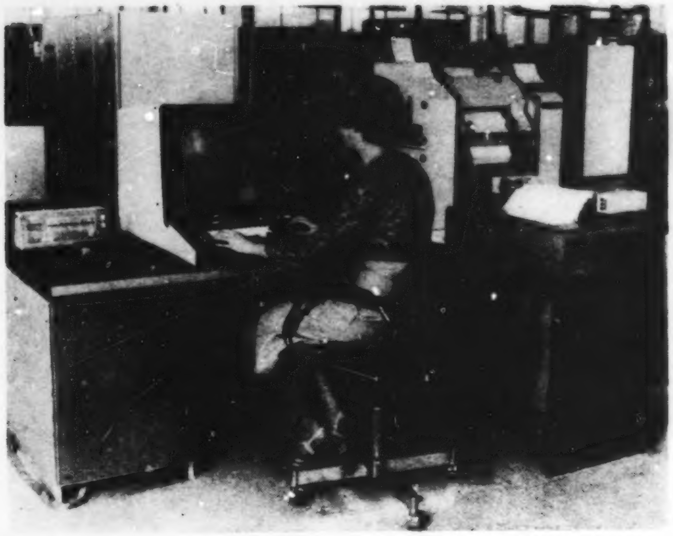


Table 1. Comparison of Computer Productivity (thousands of operations per second)

Computer	Productivity, thousands of operations per second			Remarks
	GPO	GIBSON I	GIBSON III (32 bit)	
EC 1021	26.7			3d generation
EC 1025	35	32	38	3.5th generation, first version
EC 1025	75.2	56.3	77.3	modernized (TTL)
EC 1025	75.3	54	76.9	modernized (MOS)
Siemens 4004/45	79.1	52.3	85.5	
IBM 270/125	47.8	24.7	41.8	initial version
IBM 370/125	61.4	34.4	57.6	model 2

The purpose of the modernization work was to improve the user characteristics of the EC 1025 computer. This was done primarily by improving the productivity of the operational module, in addition to which the capacity of main and external memory was doubled, the communications capabilities were improved and the system power supply was improved. The extent of microprogramming was increased, particularly by introducing locating diagnostic microprograms. The results of these innovation measures manifest themselves primarily in a considerable increase in the productivity of the EC 1025 system. The table above shows the productivity, in thousands of per second according to the international standard mixes generally designated GPO, GIBSON I, and the newest version, GIBSON III (with 32-bit operands), not only for the original and imporved versions of the EC 1025, but also for certain foreign products.

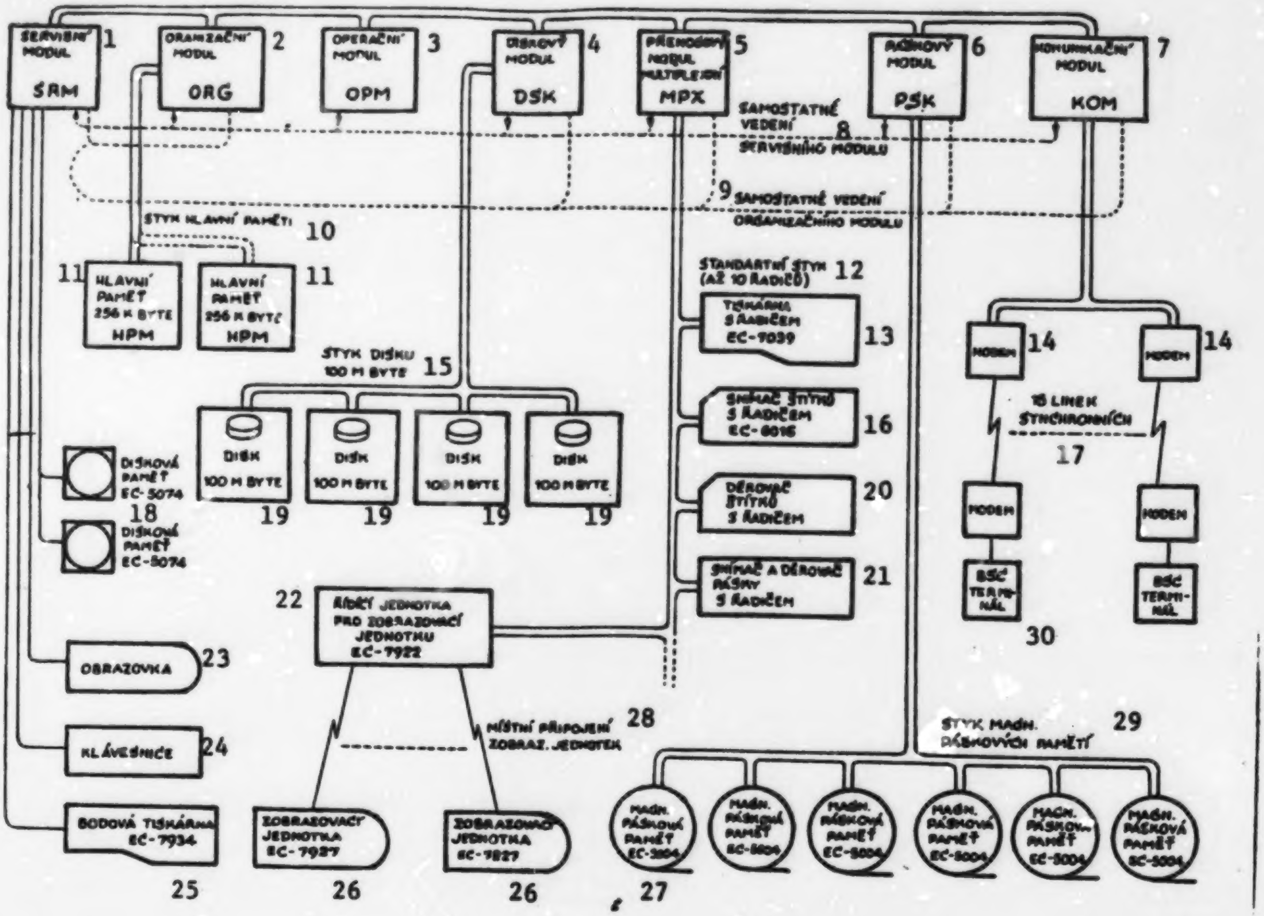
The modernized EC 1025 computer system is a general-purpose computer whose productivity parameters place it in the lower half of the modernized series of the Unified System of Electronic Computers (JSEP 2). The EC 1025 computer continues the long tradition of Czecheslovak data-processing equipment, and the advances in the design of the central processor and other components correspond to the real capabilities of the Czecheslovak development and production base and at the same time are oriented toward close international cooperation between the socialist countries taking part in the JSEP program. The EC 1025 computer system consist of the mainframe, peripherals and data-transmission equipment.

The basic system design is modular. It consists of six standard modules (service, organizational, main memory, operational, disk, and multiplex). According to user needs, three additional modules can be added (tape, communications, and an additional main memory module). Internal connection between the modules is carried out by three buses which can be used to connect any two modules together, and an asynchronous bus for transmission between the service module and the others.

Fig. 2 shows the configuration and interconnection of all modules in the mainframe. The mainframe (standard equipment) carries out the following functions:

--universal instruction set and instructions for high-precision floating point arithmetic;
--bytewise sequencing of operands in main memory;
--protection of data in main memory during read and write operations;
--operation in the basic and expanded control modes;
--dynamic address translation and operation with up to 16 Mbyte of virtual memory;
--detection and correction of errors in main memory;
--time-of-day clock, mainframe clock, time comparison, time-interval measurement;
--current address register activity;
--channel identification and indirect addressing of data in channels;
--expanded rerun procedures after errors in the mainframe and channels;
--recording of error states in the mainframe and channels;
--direct connection of up to two large-capacity memories of type EC 5067 (each of which has two 100 Mbyte units), with removable disk packs with a total capacity of up to 400 Mbyte, via the Ec 5667 control module;
--connection via standard interface with up to 10 peripheral device controllers or data-transmission multiplexers operating with a byte multiplex channel (multiplex module) containing 32 subchannels, with up to 8 of them shared (up to 16 devices each);
--connection to displays, keyboards and floppy disk service memory in the operator console;
--centralized and independent turning on an off of the system and the individual devices.

Fig. 2. Block Diagram of Modernized EC 1025 Computer


SERVISNÍ MODUL ŠRM 1
ORGANIZAČNÍ MODUL ORG 2
OPERAČNÍ MODUL OPM 3
DISKOVÝ MODUL DSK 4
PŘENOSOVÝ MODUL MULTIPLEXNÍ MPX 5
PÁSKOVÝ MODUL PSK 6
KOMUNIKAČNÍ MODUL KOM 7
SAMOSTATNÉ VEDENÍ SERVISNÍHO MODULU 8
9 SAMOSTATNÉ VEDENÍ ORGANIZAČNÍHO MODULU
STYK HLAVNÍ PAMĚTI 10
HLAVNÍ PAMĚŤ 256 K BYTE HPM 11
HLAVNÍ PAMĚŤ 256 K BYTE HPM 11
STANDARTNÍ STYK (AŽ 10 ŘADIČŮ) 12
TISKÁRNA S ŘADIČEM EC-7039 13
MODEM 14
MODEM 14
STYK DISKU 100 M BYTE 15
SNÍMAČ ŠTÍTKŮ S ŘADIČEM EC-6016 16
16 LINEK SYNCHRONNÍCH
17
DISKOVÁ PAMĚŤ EC-5074
18
DISKOVÁ PAMĚŤ EC-5074
DISK 100 M BYTE 19
DISK 100 M BYTE 19
DISK 100 M BYTE 19
DISK 100 M BYTE 19
DĚROVAČ ŠTÍTKŮ S ŘADIČEM 20
SNÍMAČ A DĚROVAČ PÁSKY S ŘADIČEM 21
MODEM
MODEM
BSC TERMINÁL
BSC TERMINÁL
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25
ZOBRAZOVACÍ JEDNOTKA EC-7927
26
ZOBRAZOVACÍ JEDNOTKA EC-7927
26
MAGN. PÁSKOVÁ PAMĚŤ EC-5004
MAGN. PÁSKOVÁ PAMĚŤ EC-5004
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Key:

1. Service module (SRM)
2. Organizational module (ORG)
3. Operational module (OPM)
4. Disk module (DSK)
5. Multiplex module (MPX)
6. Tape module (PSK)
7. Communications module (KOM)
8. Separate service module cable
9. Separate organizational module cable
10. Main memory interface
11. Main memory (256 Kbyte) (HPM)
12. Standard interface (up to 10 controllers)
13. Printer with controller: EC 7039
14. Modem
15. 100 Mbyte disk interface
16. Card reader with controller: EC 6016
17. 16 synchronous lines
18. Disk memory: EC 5074
19. 100 Mbyte disk memory
20. Card punch and controller
21. Tape punch and reader with controller
22. Control unit for display unit: EC 7922
23. Display
24. Keyboard
25. Matrix printer: EC 7934
26. Display unit: EC 7927
27. Magnetic tape memory: EC 5004
28. Local connection to displays
29. Interface with magnetic tape memories
30. BSC terminal

With the exception of the organizational module and the main memory module, all of these modules of the EC 1025 computer are microprogram controlled, which means that the individual activities in each module are selected and controlled, which means that the individual activities in each module are selected and controlled in accordance with a microinstruction sequence, i.e., by a microprogram. The microprogram firmware requires that each microprogram-controlled module have a so-called "control K memory" of variable size in which the microprograms are stored. The individual microinstructions are retrieved from this control memory and executed.

The microprograms in each module carry out three basic functions:

a. internal activities of the module;
b. interface between the module and main memory and other modules;
c. interface with extermal devices.

Below we describe the individual modules and their functions.

The service module (SRM) is a qualitatively new part of the JSEP computers. During operation of the EC 1025, the service module takes on the function of the system console. In addition to the functions of the system console, the EC 1025 service module also takes over control of the computer's operating diagnostics, and in this sense it may be considered the computer's diagnostic console. We will return to the microdiagnostic system of the EC 1025 computer later.

The service module consists of a general-purpose communications processor and a number of special adapters and circuits which transmit information on the operation of the other modules and connect the service module to its auxiliary equipment located in the operator console, i.e.:

--an alphanumeric display with a keyboard and matrix printer;
--two EC 5074 floppy disk units.

The operation of the service module is microprogram-controlled from the module control memory. Some of the microprograms are permanently resident in memory, while most alternate with one another in the remainder of control memory.

The service module carries out the following main functions:

--it loads microprograms into its control memory and into the control memories of the other modules (other than the main memory and organizational modules, which do not have microprogram-controlled memory);
--it effects communication between the operating system or the user program and the operator or floppy disk memory and between the physical systems of the computer and the operator or technician;
--it monitors and determines the operability of all system modules, responds to error messages, controls error recovery, carries out error protocols, performs troubleshooting and diagnostic measures and informs the operator and technicians about the status of the computer.

The organizational module (ORG) organizes interfacing between all modules used in the system and data transmission between them. It is also used as an interface and control module for the main memory, for which it checks memory-protection keys, checks the parity of data received on the bus, organizes received data into 8-byte groups and generates a ninth Hamming code byte for them, monitors the correctness of data read out of memory, corrects it when possible, and converts groups of 8 bytes readout in parallel form to sequences of four double bytes which are transmitted on the ORG bus, and, like all other modules, reports all error states to the service module.

In contrast to all other modules, the organizational module does not have its own control memory. Its structure is divided into two parts: the first is the main memory-control block, and the other is the block for controlling interface between modules.

The main memory module (HP) had undergone considerable change in the innovation process. The initial static 1024-bit components have been replaced by 4096-bit dynamic MOS circuits. This innovation resulted in changes in main memory, in the interface with the organizational module, and in the organizational module itself. The previous synchronous operation of the memory, controlled directly by the organizational module, has been replaced by asynchronous operation, with each memory module having its own controller.

The basic capacity of each main memory module is 256 Kbyte, and accordingly the maximum capacity of two modules is 512 Kbyte.

To speed up memory operation, the organizational module uses a cache memory, which carries out most of the communications with the operational module.

The operational module (OPM) is intended for reading and writing of control instructions, general-purpose instructions, decoding instructions, floating-point instructions and input-output (I/O) instructions.

Innovative changes in the hardware and microprogramming of the operational module increased its operating speed from an initial 32,000 operations per second to 54,000 operations per second measured with the GIBSON I mix and from 35,000 operations per second to about 75,000 operations per second measured with the GPO mix, so that in this respect too the EC 1025 surpasses many of its competitors.

The integrated disk module (DSK) consists of microprogram-control electronics for external magnetic disk memory units with replaceable 100 Mbyte disk packs or for other suitable magnetic disk memory units.

The disk module carries out both functions corresponding to those of the selector channel and functions associated with the operation of its associated magnetic disk memory mehcanisms in reading and writing at a certain location on the recording medium.

The disk module, with an "expansion" unit, can be used for connection with 100, 29 and 7 Mbyte JSEP or equivalent disk memory. This unique design makes it possible to use the mechanical components of older versions in order to achieve compatibility of storage media with other computers.

Up to four 100 Mbyte disk stores, eight 29 Mbyte disk stores or four 27 Mbyte disk stores can be connected simultaneously.

The multiplex module (byte multiplexer) makes it possible to connect relatively slow peripherals to the EC 1025 through a standard input-output interface. This equipment may operate in either the bytewise or continuous mode. The physical design of the I/O interface allows connection of up to 10 control units.

The multiplex module has 32 subchannels, so that up to 32 operations with different peripherals may be conducted simultaneously. The subchannel registers (each with a capacity of 32 bytes) are located in the control memory of the transmission processor. The address of the device with which it is to work is given by the contents of the base register and an increment given in the I/O instruction. Eight of the 32 subchannels are shared, each by up to 16 devices. The mainframe can, at the user's request, be expanded with a tape module, a communications module and the second main memory module mentioned above.

The tape module interfaces the computer's operational module and main memory with the EC 5004 tape store. The operational module controls the operation of the tape module by means of I/O instructions. The tape module performs the functions of selector channel and control unit for the magnetic tape memory.

The tape module is connected on the one hand to the internal bus of the EC 1025 computer (intermodule interface) and on the other hand to a small interface for EC 5004 tape stores. The tape module can be connected in star fashion to as many as six EC 5004 magnetic tape stores.

The tape module consists of an internal adapter, which operates directly with the intermodule interface, a universal communications processor, which consists of a microprogrammed controller with control-memory-playback unit, and an external adapter which interfaces with up to six EC 5004 tape stores.

The communications module (KOM) is used in systems intended for teleprocessing. It carries out communications between the mainframe of the EC 1025 computer and remote terminals or other computers. The communications module performs all channel functions, and from the computer end it functions as a byte multiplex channel with 16 subchannels, making possible connection of up to 16 synchronous communications lines. The terminals can be connected in either point-to-point or multipoint form.

The data-transmission system is synchronous on all lines and the BSC information interchange algorithm is used. The standard information interchange code is KOI 7 (ISO 7, CCITT No 5).

The modernized communications module of the EC 1025 expands the capabilities of the earlier communications module by connection of terminals in "modemless" fashion (according to CCITT requirements V10 and V11). Another important innovative advance is the possibility of connecting the communications module to teletypewriter networks, either dedicated or public, on either direct wire or switched lines, with either dial or keyboard dialing.

To detect and locate errors occurring during computer operations, the EC 1025 is equipped with a microdiagnostics system. It makes continuous use of the service module, of recording of the status of the module by the intermodule interface (the "log" function) and of a security system involving a security code check unit such as is used on all modules of the computer. The diagnostic functions are specified and executed by microprograms, i.e., program facilities closely associated with the hardware, which accordingly makes it possible to specify the functions of individual circuits in detail.

The computer's microdiagnostic system is divided into system microprograms and the tests themselves (test microprograms). The system microprograms, which carry out system functions and control the tests, including handling malfunctions, are stored on the diagnostics diskette. They are called from the control memory in the service module and cover all modules in the computer. The test microprograms carry out the functions of computer circuits and bring about detection and location of malfunctions in all modules of the computer. The tests are organized into groups according to the modules and external adapters of the computer, to make it possible to specify the testing of selected parts of the computer. If a malfunction is detected, it can be located to within one to three boards, depending on the location of the circuit to be tested.

In addition to these test features which are part of the microdiagnostic system, there are other microprogram features in the computer. These include tests carried out during computer operation without interrupting it, i.e., "in-line" tests of peripherals ehich are redundant in the computer system. They are used for external disk and tape memory and for remote data-transmission lines connected to the EC 1025's communications module. The feasibility of the in-line tests is based on the fact that the test, in the form of a special microprogram, is called from the operator console while operating system is functioning for use with one of a system of redundant devices. While the test is being run on the selected device, e.g., one of six magnetic tapes, the other devices of the same type, in this case the other five magnetic tape units, operate under the control of the operating system.

The microdiagnostic test system is currently being expanded to include microprograms for analyzing recording of the condition of the system following an error. During operation of the computer, states of the system following an error are continually recorded by devices for direct readout of module status. These microprograms are intended to make it easier to locate the causes of intermittent malfunctions. It is generally known that intermittent malfunctions are difficult to eliminate even during computer troubleshooting and use of a microdiagnostics system.

Table 2. Basic Configuration of the Modernized EC 1025 Computer

	Name	EC series designation	Number of units	Remarks
1.	Processor, consisting of:	2025	1	
	a. Organizational module (ORG)		1	
	b. Operational module (OPM)		1	
	c. Main memory (MEM)		1-2	256-512 Kbyte
	d. Service module (SRM) with operator's console and console devices:			
	--Memory with replaceable floppy disks	5074	1-2	
	--Alphanumeric console display		1	
	--Alphanumeric keyboard	0101	1	
	--Serial matrix printer	9734	1	

	e. Disk module		1	
	f. Tape module		1	
	g. Multiplex module		1	
	h. Communications module		1	
2.	Disk store with removable disk	5667	2	4 spindles
	packs and control unit	5667	1	
3.	Disk store	5075	2	
4.	Alphanumeric printer with control unit	7039	2	
5.	Tape store	5004	4	
6.	Display system	7920-20	2	
7.	Disk manipulator	9112		

8480
CSO: 2402/2

BRIEFS

VIETNAM'S ELECTRONIC PRODUCTION ASSISTED--Eng. Le Van Triet, deputy minister for machinebuilding and metallurgy, and general director of SRV's electrotechnical industry has visited Czechoslovakia to negotiate increased cooperation between Vietnam and Tesla Electronics Parts concern in Roznov pod Rodhostem, CSSR. The deputy minister stated that the newly-developed Vietnamese electronic industry has already been successful in production of transistors. Future cooperation with the CSSR should gradually enable the SRV production of variable condensers, resistors and other electronic parts. He also stressed that great care will be paid to quality of products, as well as timely deliveries [presumably to the CSSR]. [Prague MLADA FRONTA in Czech 24 Nov 81 p 2]

CSO: 2402/6

CONCEPT, PROBLEMS WITH ES DEVICES IN BULGARIA

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul-Aug 81 p 20

[Text] During the past 10 years, as a result of the technical-scientific revolution, the material-technical base of the country has been radically transformed. The efficient application of computer technology devices in the various branches of the economy plays an important role in this process.

A broad network of computer centers has developed in our country. The formation of developed communications systems has begun at two levels--on the one hand we have created regional systems for remote data processing (on the basis of a communications link between the user and the regional computer centers), and on the other hand there is a multi-computer network realizing communication at the national level. All this aids the introduction of enterprise AIR [automatic guidance systems] and their sub-systems at the individual enterprises. In these systems the emphasis is slowly shifting to those sub-systems and tasks which have an active effect on guidance, increasing the efficiency of guidance to a significant degree. This trend is resulting in a perfection of enterprise and national economic guidance and work organization.

Another most important trend which can be observed in the area of designing and introducing AIR systems is the spread of model projects.

The standardization in planning is realized today in the following ways:

--the development of model projects,

--the use of applications program packages and model solutions in the development of individual projects, and

--a broad dissemination of model projects which can be used many times.

The developments of recent years justify the utility of this approach. At the same time we can also point to a whole series of problems which reduce the applications efficiency of existing and to be developed computer technology tools.

The principle of a complex approach to common problem solution is not followed sufficiently in the design and introduction of enterprise AIR and AMT [possibly: automatic engineering design] systems. One still finds that they would rather automate individual partial tasks. This is because there may already be a finished program for this or because the information needs of leading organs are not entirely clear. Ad hoc developments make up the overwhelming part of the AIR systems introduced. The reproduction of completed and introduced systems--even within the same chief authority--is still in its infancy. Few integrated branch systems are being developed even now.

An analysis of the activity carried out thus far shows that we must accelerate the introduction of technical achievements in order to achieve better production results, use materials and raw materials economically and better exploit production capacity and manpower.

The development to be realized by Bulgaria in the Eighth Five-year Plan (1981-1985) represents a new phase on the path of building a developed socialist society. The chief emphasis will go to technical progress, as a realistic pre-condition for increasing labor productivity and raising national income, and this will lay the foundations for the "intellectualization" of material production.

One of the most important trends in the realization of this policy is the automation of production and guidance, the use of ES tools. A new epoch is beginning in the development of automation systems also, which can be explained by the following objective requirements:

--the guidance of production is shifting to economic foundations,

--the level of production technology is improving significantly as a result of automation being realized on a micro-electronic base, and

--we are using new, modern guidance methods.

We must perfect in practice the functional structure of the AIR systems so that the development of new systems, the construction of new enterprises and the introduction of new technologies will be closely linked with the modernization of existing facilities and the complex intensification of the branch.

The development of the material-technical base of production has now reached a stage for us where the perfection of the functional structure of the AIR systems must lead to the development of complex automated systems and their integration at various guidance levels. The complex character of automated systems manifests itself in the design of enterprise guidance sub-systems; it is linked with technology process control and the automation of engineering work. In essence this means that in the course of the further intensification of the national economy ever greater attention must be devoted to the introduction of complex automated systems and technological lines, which [illegible] realized on the basis of the new technology and new work organization methods.

We must include among the integrated automated systems the exchange of information between various levels which develops on the basis of uniform hardware and software and uniform planning and record keeping methods.

This can be done only if we conduct a uniform technical-scientific policy in the area of computer technology use and automation. A scientifically based complex national production and guidance program has been worked out for the Eighth Five-Year Plan, called "Automation VIII," and the special programs of the several branches have a place in this.

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CEMA COMPUTERS IN METEOROLOGY

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul-Aug 81 p 2

[Article by Jozsef Horvath, National Meteorological Service, Central Forecasting Institute]

[Excerpt] Earlier the meteorological institutes of the CEMA countries used linear computers with very different architectures (BESM-6, ODRA-1305, EMG-830, MINSK 22 and 32) and only with the newer computers now to be installed are they striving for uniformity by purchasing ESZR [Uniform Computer Technology System] equipment. In Czechoslovakia they plan to replace the existing ES 1030 and ES 1040 with a double ES 1055: an ES 1022 is operating in Bulgaria; in the GDR and Poland they are planning for an ES 1055 and in Hungary the plans call for an ES 1060.

These computers, however, support batched applications and do not represent the most ideal solution from the viewpoint of continual (stand alone) operation or parallel processing possibilities.

The peripherals for the ESZR computers are not satisfactory for meteorological applications from every viewpoint. One of the chief problems is that at present one cannot get magnetic disk background stores of sufficiently large capacity. In this area the 100 and 200 M byte Bulgarian disk units which are expected will be a great step forward. The other problem is that the speed of the graphic units which can be obtained from the socialist countries is very slow; for example, displaying the European meteorological situation in map form with these computers is slower than with experienced manual draftsmen. The solution might be a high speed pen, or even better electrostatic, graphic unit.

In addition to the deficiencies in regard to ideal solution capabilities and the available peripherals it is still a problem that experiences are generally negative in regard to the reliability of the ESZR machines.

What is the Situation Here at Home?

Since about 1970 the acquisition of a large capacity computer--the plans at the time were for an ES 1050--has been on the agenda to support the services offered by the National Meteorological Service (OMSZ). But only one EMG-830 was purchased and this has served climatology for nearly 10 years.

In the middle 1970's the OMSZ bought an IBM System 7 minicomputer to automate the flow of domestic and international data. This has been operating reliably since then. In the meantime the large computer plans were oriented toward an ES 1035 and it appeared that realization would come about in the very near future.

In 1980 the EMG-830 was replaced by a double TPA-L configuration, which continues to serve primarily the collection and statistical processing of climate data. With the slipping of the time limit for construction of a computer center the plan for an ES 1035 shifted in the direction of a larger machine, the ES 1060.

According to the plans this system will be handed over during 1983-1984. The OMFB [National Technical Development Committee] will cover the costs of machine purchase and software preparation work.

The daily quantity of data reaching the Central Forecasting Institute of the OMSZ from domestic and foreign meteorological sensing stations comes to about 1 M byte. The data will be received by the above mentioned IBM data transmission computer, checked, selected and handed on to the ES 1060.

It is expected that beginning in the second half of the 1980's pictures from the three domestic weather radar and meteorological satellites will enter the system on-line. This quantity of data could be several times 10 M bytes daily.

There is still a question in regard to what the linear architecture, speed and capacity of the ES 1060 will make possible in regard to real time running of complex picture processing methods.

We are developing our own data base management system for storage and retrieval of data, taking the following conditions into consideration:

--it must handle large quantities of data arriving continuously and not changing with the passage of one or two days;

--the connections between data records and the retrieval considerations must be relatively simple and well defined;

--the system can "forget" a part of the data older than a few weeks but it must archive another part on magnetic tape; and

--the query programs will not see from above whether the data sought is on disk or on the archive tape.

A few of the meteorological maps and diagrams must be drawn automatically at given times from the data collected while others will be prepared only on special command. The processing system must give warning of certain critical weather situations (strong winds, frost, snow, storms, etc). Short range (maximum of 48 hour), medium range (3-10 day) and long range (10-30 day) forecases must be prepared partly on the basis of forecast data disseminated in digital form by world centers and partly on the basis of an atmospheric model developed within the OMSZ (this is in addition to an analysis of the current situation). Observational and already processed data must be presented in an understandable way via display terminals also. We plan the following configuration to carry out the above tasks: an ES 2060 [as published] central unit (one million operations per second), 2 M bytes of semiconductor central stroage, 8 x 100 M bytes of magnetic disk storage, eight magnetic tape units, two line printers, two punch card punches, one punch tape punch and reader, two plane plotters, one electrostatic plotter, four alphanumeric display terminals and one graphic (raster) display.

We also plan to set up remote links later to automatically disseminate special forecasts or to query data stored in the system. We want to use the system with an OS/MVT or OS/VS operating system.

Preparation of the programs has begun on a leased ES 1040 computer. The preparation of programs for reception of incoming data and storage in the data base, for forecasts based on search for past analogies and for drawing meteorological maps is underway already. Further research and testing is needed to prepare forecasts with numeric methods, to process satellite pictures and to realize automatic danger signaling.

It can be seen from what has been said that the direction of our developments is determined to a large extent and also limited by the fact that parallel systems are not available in the ESZR offerings and cannot be obtained from the capitalist relationship for financial and other reasons. Such systems are needed by other scientific areas in addition to meteorology. The planned system--which hopefully will be realized--will be one of the largest configurations among the meteorological institutes of the surrounding countries and by increasing the level of domestic meteorological services it will raise the National Meteorological Service into the medium domain of Europe.

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HUNGARY

NEW MAGNETIC TAPE SUBSYSTEM IN THE ES

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul-Aug 81 p 9

[Article by Dr Zoltan Szabo]

[Text] International testing of the Soviet developed ES 5525.03 magnetic tape control unit and the GDR developed ES 5002.03 magnetic tape storage unit, which are parts of the second series of the uniform computer system, was completed recently in Karl Marx Stadt. The subsystem performed successfully in the course of these tests and it is to be hoped that beginning next year the ES 1055 computers will be delivered with these subsystems. Series manufacture of the tape unit is planned beginning the end of 1981 in the ZEISS works in Jena.

The following tape units can be connected to the Soviet control unit, a maximum of eight at one time: the ES 5002.03 (GDR), the ES 5003.03 and ES 5612 (Bulgaria) and the ES 5017.02 (Soviet Union and GDR). This equipment can be connected via a combined radial-linear interface to the computers of the ES 1 and 2 series or to control equipment. (The control unit has a two channel change-over switch.)

The chief functions and parameters of the ES 5525.03 are as follows:

--execution of channel commands,

--data transmission between tape unit and channel,

--passing information to the channel concerning the state of the control unit and tape unit, and

--checking the correctness of data transmission.

Power used is 1 kVA; the size is 1,200 by 750 by 1,600 mm; and the weight is 400 kg.

The chief technical data for the ES 5002.03 storage unit are:

writing method:	PE/NRZ-1
tape speed:	3 m/s

reading and writing speed:	PE: 189 k bytes/s
	NRZ-1: 96 k bytes/s
writing density:	NRZ-1: 32 bit/mm*
rewind time:	equal to or less than 60 s
number of channels:	9
power used:	2.5 kVA
size:	1,600 by 800 by 665 mm
weight:	320 kg
reading:	in both directions.

From the user viewpoint the essential characteristics of the magnetic tape storage include the standard writing format (ISO/TC 97/SC1139 and ISO/R 1863). This ensures compatibility with similar ES tape units and with the IBM 3420-5 model. The double magnetic head block (a writing-reading head) ensures error free information writing and 100,000 readings of information written once. The equipment threads both traditional spool and cassette (cartridge) tapes automatically in under a maximum of 30 seconds. This can reduce tape exchange times and it simplifies the work of the machine room operators. A built-in card helps to check the tape unit; its operation has not effect on other tape units connected to a common control unit at the same time. The front and back doors can be opened. The modular construction aids swift elimination of errors and easy access in event of repairs. An automatically opening and closing glass window can be found on the front door, which is opened only during tape exchange. By using low noise level moving elements the noise level of the tape unit is minimal. Unlike earlier tape units (the ES 5017) the number of indicators has been reduced, they are better placed, and operation is thus simplified. Thanks to the substantially faster and more reliable electronics made up of highly complex integrated circuits and thanks to the simple design the external dimensions were reduced and the weight was reduced by about 10 percent. The MTBF of the tape unit is 1,200 hours. This represents a substantial improvement compared to the reliability of earlier ES models.

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*[The writing density for the PE writing method was omitted from the table, which repeated the writing speed instead.]

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CONDITIONS, FUTURE OF TECHNICAL INTELLIGENTSIA DISCUSSED

Budapest MAGYAR HIRLAP in Hungarian 28, 29 Oct 81

[Article by Tibor Franka: "Where Is the Technical Intelligentsia Going?"]

[28 Oct 81 p 5]

> [Text] The Federation of Technical and Scientific Associations [MTESZ] held its 13th convention of delegates in early October. Among other things, these words were heard during the discussion: "...poor treatment of the creative energy, professional knowledge and readiness to take action is at least as serious a mistake as wasting material means." In our report today and tomorrow--in connection with this statement--we will explore what problems and tasks occupy our technical intelligentsia these days, and the way they do their work.

What is the extent of technical and technological progress a country, poor in energy sources and raw materials, can expect if it does not utilize with the necessary thoroughness its intellectual capital (productive strength of the highest order)? It can hardly expect to remain lastingly competitive. It can even expect to run head to head in the early stages.

I heard two interesting reports in recent weeks. The first one is that there are few applicants to the technical university, therefore they even have auxiliary admittance schedules. The other report is that there are few of the engineers working in the various areas of production, economy research who are doing work commensurate with their training, and at least as hopeless is finding a job--not as an engineer--but performing engineer tasks. The reports prove that in recent times our society has not placed the proper value on technical careers in accordance with the changing economic and production requirements, moreover it can not even properly employ those engineers who are (or would be) available. Are there too many engineers? No. Then are there too few engineering tasks? Or, are there too few real engineers? By any chance, are income and the lack of hope for the future causing unrest? Do training and advanced training keep stalling?

A young chief engineer gave this opinion: "One can do two things with a technical diploma. He can do engineering work at the level and for the money for which there is a demand now, or he can do anything as long as they pay for it."

Attila Kurti mechanical engineer, P. N. designer, and Mrs Arpad Szabo investment engineer gladly squeeze a little room for me on the back seat. They are traveling to a planning session in the districts. The car starts out slowly--and, according to its driver, in the interest of saving some gasoline--also travels slowly.

"I am not surprised that few people choose the engineering profession" says the designer. "I am working 12 hour days now, but even so my monthly income does not exceed 8,000 forints. In a part time job my employer pays me 1,000 forints for doing jobs for example, which our institute, would not take on for even a half a million. If I became a private electrician, I would make several times that much. But this career cannot be abandoned, much less suspended. We are just like the acrobats. If we once quite regular practice, we will not take the stage ever again. I am a technical intellectual. How far can I go with it? In the past I cleaned out attics on the weekends, carried mortar, and picked up stones on the railroad. I needed the money for an apartment."

"After 22 years of employment my [monthly] pay is 5,500 forints"--says Attila Kurti. --" In the past I used to drive taxicab, but now even that is not worth it. More recently I have been living on foreign tourism. I sublet my apartment to IBUSZ [Touring, Money Changing, Traveling, and Shipping Co. Ltd.]. I have just painted it, to make it as desirable as possible."

P. N. remarks: more and more new facilities are turned over to production without his presence. Is only the ribbon cutter needed there? It is not so simple. Rather, they forget to invite the designer because there is no money left for him, and after the handshake of recognition they can not hand him an envelope bulging with money.

"In general, the designer's activity can not be measured...That is, they do not measure it, they do not qualify it. It does not even have any particular significance. At first I made every effort to make the best possible design, costing as little as possible, but finally what I designed was not built, anyway. One material is expensive, the other can not be obtained, and so on."

"The investment engineer is equivalent to the doorman" says Mrs Szabo. "Even now the trunk is full of drawings. I am taking them to the builder. Of course, the big investors also have the money. We just run around, relay things, check on things, but we have nothing to say about what we are getting paid for. If one were to openly speak his opinion now, tomorrow perhaps he would not be able to get a job. There is no work to be done at home, because the sign-in sheet is the boss. I can work beyond my regular working hours only if my superior agrees."

"In our company the job of investment coordinator for a long time was not considered a separate professional area" says Attila Kurti. "Many people are sitting in these chairs who are "sluffing off". They are fortunate to be held responsible only rarely for their foul-ups [sic]. Nevertheless in creating something, in establishing a facility the investment coordinator has a key role, since he has the money. The standards and the success of the investment depend on him. He must be familiar with the technical and economic possibilities, and with the market. Unfortunately it is true that in general the engineers are given specific assignments, and this is the worst thing that can happen. Only the instructions have to be implemented, not much else is expected of them."

He is taking this trip to prove to his employer that he is right. An investment of 3 million [forints] must be implemented in D--- city. The only question is, why? Namely, its predecessor was built at a site in the capital city a few years ago, but even that is not being exploited. It would be all the same to Attila Kurti, but he would like to prevent waste. Of course, just because he is right, that drier may still be built in D---.

One of them has already given in. His brother-in-law who is also an engineer but makes a better living as a private retailer, has invited him to be a partner. "At least, I would not have to be embarrased when I invite him for a visit"--he said. Attila Kurti often visits places in foreign countries, of course not on official assignments.

"I travel much as a tourist. I can afford it for the time being. As I watch my fellow tourists, usually I am the only engineer among them. It is sad that the engineer, on whom our progress is built, only brings up the rear with respect to financial recognition. And we must immediately come up with the best, the most economical [solution], on the bus in the morning. There is no time, and we also have no trade journals, not to mention libraries, microfilms, or information. There are hardly any official trips, and even for the ones there are, they don't send the common soldier."

All engineers have technical licenses. But they do not have the same knowledge, training, information and job assignment. That is, there is an absolute difference between a mechanical engineer and a horticultural engineer as far as the importance of their respective activities is concerned. (At least there should be.) There are some differences, but these are so large that it is unfair. In the words of Lajos Papszt council president of Lengyeltot:

"A few months ago I myself was also working as a design engineer. Even then I considered it unjustified that, for example, architectural engineers should earn so much. There is also an architectural engineer with average training working in our area. He receives assignments for at least 30 single family homes a year. One long evening is enough to prepare one plan. Yet its price is 3,000 forints. On the other hand, the town hall cannot afford an engineer. And that is what would be needed here for technical supervision. But I cannot afford to pay for it. Generally speaking, in my opinion the true engineer can make a living only where the economic management recognizes that professional knowledge is needed for growth.

The outlook I met in the Szekszard headquarters of the Tolna Megye State Construction Industry Enterprise, proved that the council president was right:

"A firm like this does not make progress because of the engineers...Come on!"--was the opinion of one of the older technical assistants.--"One can get farther ahead with a good venison stew, and a supper with wine, than with technological resilience."

"Unfortunately, there are fewer deer than we have problems."

"Nevertheless, a few weeks ago the world's largest antlers were shot in our neighborhood. But that was worn by a buck"--he added.

[29 Oct 81 p 5]

> [Text] In the first part of our report yesterday we discussed the occupational, financial and morale problems of our engineers. What has to be done in the interest of success in foreign trade, in the areas of production, training and education? Today's report discusses these.

The technical preparation assistants of the Tolna Megye State Construction Industry Enterprise has the opinion at the end of my report yesterday: an enterprise like this does not move ahead because of its engineers. It is true that they do not have this training, but because of their ages and experience they do (or may do) the same work as the people with diplomas. They review sackfuls of plans each day, read budgets, cut out things with the scissors and only after such Sisyphean work do they make recommendations even on such things as whether or not the firm should accept the bid in question. They do not like this work, and the money paid for it is also little. Geza Czank plant engineer works for this enterprise.

"I do not take the responsibility for my opinion"--he begins in a loud tone.--"There are too many engineers? Well, yes considering the number of engineering positions, and not everyone can be promoted, either. I started out in production, and getting promoted from there is a complete accident...That is, practically unimaginable without connections and patronage. By this they also make the situation of the workers more difficult. That is, they already know that it would also be best for them if the engineer could do whatever would make the activity of the worker easier and better organized. But for the most part those at the beginning of their careers can work only where they are assigned. If he is doing well he may become a foreman, that is, he can do what one can with a sixth grade education can also do.

Good Work Is a Threat

Why does underemployment exist today? Because the abilities of the technical intelligentsia studied do not make them suitable to do real engineering work. Or he is capable of handling the job, but the employer simply does not need engineering work. And finally: the employer cannot get manpower from elsewhere to perform semi-technical jobs for low wages...(for example preparation work, technician, foreman).

"Of course the situation of the real engineer is no better, either"--says Geza Czank. --"Even he should also not work fast or do exceptionally. That is, many of the people with lesser training consider good work a threat."

"People give orders who do not know anything about the project I have to carry out." --says Emil Morgasi appointed chief engineer.--"It is tiresome to argue and reason over the long run. We have eight engineers working here in this facility in Dombovar. Two of them even do engineering work...10 years ago there were three times as many applicants as spaces at the university. And now this is where we are. A person can have talent and drive, he still cannot earn more than the average. And because of this very thing, even the stupid ones can make a living. Even though a good engineer can produce many times as many for the plant as the one who, let's say, puts matchsticks into this matchbox"--he says. flicking a matchboxful before us on the table. --"I, think I can too. From now on I am not saving for a color TV, but for machinery and I will set up shop at home in the shed...If it goes well, I will take off the chief engineer's suit."

Lacking Concepts

We talked with Dr Istvan Palfalvi, first assistant professor of the Budapest Technical University, about the reasons for today's unfavorable situation which I am far from having described fully. He has also been involved in the training of techncial professionals for almost 10 years.

"In the post-war years training in the entire area understandably ended. This was justified during the transitional period. But as a result of this, industry and training became divorced from each other. Unfortunately, the necessities have not changed too much even to this day. However, today professional knowledge is the most important. Unfortunately the transition period of 30 years still plays a role. We have fallen behind, there is no doubt. Primarily because there were no clearly and precisely defined training programs, and we did not pay attention to the countries more advanced than we were, and who have already overcome earlier the problems we were having. We not only should have increased the performance and quantity, but the technology and preciseness should also have been perfected. This latter has not been accomplished even to this day."

[Franka] "Our industry's earlier history had a number of technical geniuses famous all over the world. In your opinion, what is the situation today? How [good] are training and education today?

[Palfalvi] "There are some good ones, even very good ones today, too. What I feel is missing is a well-founded, correct and uniform educational format. I will prove to you"--and he places charts before me--"that we should be following the conceptional French methods, or those of countries of similar order of magnitude, such as Holland or Switzerland. Yet we are copying that of the Germans and of the English, and in a number of cases we cause modifications to be made even in these after a year. It follows from this that it is impossible to get a feedback and to evaluate them. This way, this is only a car...without wheels. I am convinced that the system of secondary trade schools has become obsolete, this is the reason among other things for not having enough foremen and technicians. This is why the line of training the industry needs has shortages. At this time the knowledge of young people graduating from the secondary trade schools has shortcomings in the areas of humanities as well as in technical areas. They cannot speak sensibly, write correctly, and they have big mouths. Instead of this, we would need secondary schools where the child receives a much more complete basic education."

[Franka] "We also have elite engineering training now in this country. They are the link between society and production. The question is, are they needed?"

[Palfalvi] "Absolutely. The only problem is that even they do not have the proper basic education, since they attended the same secondary school as the others. Of course, our respects to the few exceptions who made up for these shortcomings through their own diligence. The other improper thing is that even the elite engineer does not get to be that by the process of selection, but we decide in advance when he is 18 years of age, who has the proper abilities. It can also be seen from this that training is more of an administrative work process rather than personal upbringing. The dinosuurs died out because their nerves required a minute and a half to react. By the time it realized, the enemy had long bitten through its throat. Thus we also make decisions in advance about the young people who appear to have talent."

[Franka] "Thus the university's possibilities are, in many cases, even smaller than could be imagined?"

[Palfalvi] "Our text books are excellent, for example"--he shows me a few--, "and so are also the foreign literature. It is a rare for one not to also have a Hungarian author. I mean, of Hungarian ancestry. Many of them graduated here. This absolutely trying to tell us something. Primarily, about the lack of perspective in this country. The training is still specialized, and learning has the character of being rote. It is not even in the right place for training plant engineers. Our library was built when we had only 500 students, and not 5,000. And there is no system of requirements or evaluation on the outside. There is no differentiation between one engineer and another. But now the primary need is for professional knowledge. This will also be decisive, in contrast with the earlier time periods as who should be put into higher positions today. An economic manager must have excellent knowledge of the areas in which he makes decisions. Everything else can be only secondary."

It Is Easier to Keep Yanking

[Franka] "What way do you see out of the present situation?"

[Palfalvi] "In my opinion a unified and complete training concept must be urgently defined. That is, everything that belongs here must be handled simultaneously and continuously. Reinforcing some of the details cannot bring success. Past practice also proves this. Professional training to bring people up to standard must also be solved parallel with this. The level of training of almost half the engineers falls short of that of the developed industrial countries. However, well prospering social organs are needed to do this. To put it in points: insuring the conditions for a goal-oriented and clear concept and training. And individually, keeping up to the professional standards. If these would exist together, in my opinion we could work off our backlog as quickly as after the war, in a few years."

He walks to the window and leans on the ledge.

"Come here, please"--he looks back at me.--"You see, that worker in the yard has been trying for several minutes to pull an angle iron out from under a large pile. He does not take the load off of it, rather he keeps yanking it...Well, it just got bent, too. That will have to be straightened out. He caused more damage by this than the value of the angle iron...There is no foreman, and this not the engineer's job. You see, now he calls his partner to help. The too of them continue pulling on it..."

In this country this is still the simpler thing to do.

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COMPUTER ACHIEVEMENTS, PROBLEMS IN BULGARIA

Budapest SZAMITASTECHNIKA in Hungarian No 7-8, Jul-Aug 81 p 20

[Article by Khristo Karadzhov, candidate in technical sciences: "Achievements, Problems, Plans in Bulgaria"]

[Text] Our tasks in connection with the automation of production and guidance were executed during the Seventh Five-Year Plan in accordance with the Seventh Central Automation Program. Looking back over the achievements of computer technology during the Seventh Five-Year Plan, we came to the following generalizable conclusions.

The Path Followed

We carried out the tasks posted in the program in regard to automated systems guiding technological processes, solving business tasks, complex systems serving guidance of enterprises, certain partial systems aiding the work of branch and functional organs and systems serving automation of designing and technological tools.

Financial fulfillment was much smaller than prescribed in regard to tasks connected with production control and automation and this had an unfavorable effect on the capacity and quality of systems and partial systems introduced.

In this period efforts were directed primarily at setting up certain partial systems serving guidance of enterprises and branches.

The economic effect of automation activity figuring in the annual plans was 91.3 percent. Within this, however, we achieved an especially high degree of efficiency with systems automating planning--a profit worth 13.9 million leva annually.

It can be said that the average repayment time for material assets invested in automation is around 2 years, which corresponds to the experience of other countries.

The Ministry of Electronics and Electrotechnics and the Ministry of the Machine Industry did not succeed in satisfying demand; they did not provide tools in sufficient quantity or of appropriate quality.

The number of experts working in the areas of production and guidance increased greatly. However, the training and retraining of leading cadres and experts lagged behind.

There were positive changes in the plan period in the organization and guidance of automation activity. In accordance with a resolution of the Bulgarian Communist Party and the Council of Ministers we created a national council dealing with automation of production and guidance which has the task of guiding and supervising the program. This, however, has not yet produced the necessary organizational conditions. Some ministries and guiding organs still do not have the experts to guide and coordinate this activity. The situation is especially alarming in the Ministry of the Machine Industry, where they still have not established a computer technology center and where a uniform system to guide and coordinate automation activity is developing very slowly.

In the course of carrying out the guiding principles of the 9th party congress pertaining to making production more intensive the spread of computer technology continued at a swift pace in the plan period. As of August 1980 more than 500 computers were in operation. The number of computers more than doubled as compared to data for 1975. More substantial than this, however, was the qualitative change in the structure of the computer park. In 1975 only 35 percent of the computers were third generation while 70 percent were in 1980.

Total capacity of operational storage increased 3.4 times and the number of operations carried out per minute increased 3.9 times.

Despite the successes achieved the condition and developmental pace of our computer park are characterized by a significant backwardness as compared to those of the other socialist countries.

Efficient utilization of the computers is a first priority problem. This is shown by the fact that average utilization was 38.8 percent in 1975 and only 41.8 percent in 1979. The same index in 1979 was 42 in Czechoslovakia, 48 in Poland, 58 in Romania and around 68 percent in the FRG and the developed capitalist countries.

In the interest of better utilization the State Planning Committee and the Labor and Wage Committee worked out a number of regulations for the years 1978-1980 which aid an efficient utilization of computer technology.

--They worked out provisions regulating the acquisition and leasing of computers.

--They worked out an accounting and billing system for computers used in the multiprogrammed mode.

--They introduced a uniform statistical system which encourages use of computers in the multi-programmed mode. This makes it possible to increase computing capacity.

--They adopted new norms for the classification of computer centers which obliges those in the higher category to make more efficient utilization.

The State Committee for Scientific and Technical Progress made a comprehensive evaluation of computer technology service activity. Guiding principles were worked out to reduce repair times and harmonize the quality of the services performed with lease fees and the price of various services.

To sum up, the execution of the computer technology program of the Seventh Five-Year Plan can be judged as successful. This provides a suitable base for the fulfillment of the tasks posted for the Eighth Five-Year Plan.

Tasks

In accordance with the guiding principles of the Bulgarian Communist Party (the Eighth Five-Year Plan being the plan period for technical progress) a complex program for scientific and technical progress up to 1990 has been worked out under the leadership of the State Committee for Scientific and Technical Progress and the State Planning Office. The goals, tasks, necessary reserves and expected achievements in this area were harmonized in an inter-branch program for the automation of production and guidance in the period 1981-1985 called "Automation VIII."

Starting from the trends outlined in the development of automation in the past 3-4 years, the efforts and reserves of the Eighth Five-Year Plan will be concentrated primarily on the development of automation in the area of material production. In accordance with this the emphasis will be on the first two of the three chief trends (automation of technological processes, automation of engineering work and development of leadership information systems).

Taking into consideration the world trends, the developmental conditions for all productive branches and the position they occupy or the role they play in the economy, the tasks will be concentrated on developing and introducing automated systems which have a direct link with energy conservation, efficient use of minerals and raw materials, reducing personnel, raising the level of the infrastructure, and with transportation, construction, communications, etc. The development of a production and leadership information system will create conditions for further coordinated brance and inter-branch activity.

In the area of leadership information systems chief attention will be devoted to creation of branch (AIR [automatic guidance systems]) and enterprise automatic guidance systems (AVIR [automatic enterprise guidance systems]) which will have a crucial effect on the development of national income and on increasing production and which will be an important aid to leadership in the new economic mechanism.

The creation of the national system (ESGRAON, SATON) planned to serve the administrative needs of the populace will continue during the Eighth Five-Year Plan also.

Great attention will be devoted to ever better utilization of existing and newly available computing capacity, to development of a few unique infrastructural systems for automation and to the development of new structural trends.

The program prescribes an intensive introduction of tools and systems which can be used in the automation of production and guidance, with the following goals:

--increasing the productivity of work and the efficiency and quality of production in every branch and activity of the national economy,

--conservation of energy, minerals, raw materials and manpower,

--raising the technical level and efficiency of infrastructural branches and activities (transportation, communications, etc),

--shifting from individual machines and systems to systems consisting of many machines and complex processes,

--creating a new structural trend in the national economy--programmed industry, and

--development and broad scale introduction of automated systems serving the guidance of operational production and of microprocessor systems which automate technological processes.

Fulfillment of the tasks of the program will ensure the following more important achievements:

--shortening the innovation process,

--improving the quality and competitiveness of products,

--increasing the efficiency of leadership,

--shortening the time for administrative services to the populace,

--improving rail transportation,

--automating and simplifying engineering work, and

--improving environmental protection.

Achieving the goals and carrying out the tasks put forth in the "Automation VIII" program presumes the availability of the necessary resources (financial, personnel, computer technology, automation tools, etc).

In accordance with the consequences of the new economic mechanism a significant part of these resources must be provided from the funds of the trusts, ministries and enterprises. Only a few large, comprehensive systems will have central financing. In the interest of realizing the program maximum attention must be given to the personnel available to the enterprises and trusts. The computer technology tools must be provided from domestic and socialist country products. During this period 130 universal computers and more than 200 minicomputers will be put into operation. The total value of the technical tools which can be provided by the program is around 716 million leva.

Introduction and operation of the systems developed will be carried out by the GIIC and the organizational sections working for various economic organizations. Where such organizational sections do not exist they must be created. It would be useful to create a specialized organizational organization for chief authorities and for the state budgetary institutions.

It must be emphasized that despite the problems the program can be carried out; we must count on the reserves which can be mobilized by the management organs.

8984
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LIGHT-POLARIZATION MODULATORS OPERATING ON THE BASIS OF THE PHOTO-ELASTICITY PRINCIPLE

Budapest FINOMMECHANIKA MIKROTECHNIKA in Hungarian Vol 20 No 9, Sep 81
pp 269-273

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MTA [Hungarian Academy of Sciences]

[Abstract] The analog light modulator was described which can modulate at a depth of 100 percent in the base harmonics (in-phase or opposite-phase) or the second harmonics of the generation, can be operated as a chopper at generation frequency with variable transmission or extinction amplitude in-phase or opposite-phase of the generation, permits variation of the AC:DC ratio over the full range (between zero and infinity), and enables the frequency range between 40 and 1,000 kHz to be covered in every 1st-harmonic mode while permitting a modulation of 4 MHz in the fourth harmonics. The optical anisotropy is induced with acoustic waves in homogeneous material so that the modulation is observable in a harmonic of the ultrasound. Prototypes featuring various resonators were designed, built and tested; they confirmed the theoretically expected performance characteristics. Figures 10, references 5: 2 Russian and 3 Western.

2542
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HIGH-PRECISION OPTOELECTRONIC PICTURE SCANNING WITH A PRECISION MECHANICAL INSTRUMENT

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian Vol 20 No 7, Jul 81 pp 222-224

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[Abstract] The problems encountered in the development of a high-precision optoelectronic scanner for the sectional image of the recombined differential hologram obtained by means of real-time holography in a laser interferometer were described, and their solutions were discussed. The integrated circuit developed for this purpose, the so-called line detector (Type CCD121 HC), has a sensing area of 22.464 mm length with a total of 1,728 discrete sensing elements. The individual sensing elements of the evaluating "vector" have a size of 13 x 17 micrometers, whereby the dimension of 17 micrometers is at the same time of the width of the vector. The detector must be moved directionally under special conditions since the surface area to be scanned has an area of 22 x 22 mm. To provide the required precision movement, a Type ESCAP DC drive motor with a 1:1.74 transmission, smooth movement, and special tachogenerator, was chosen. The information is transmitted to the microprocessor after each 13 micrometer section, and each step must be executed in identical time. The rotary movement is converted into straight movement with a cam-type mechanism. The device described scans a picture at adequate accuracy. A microscope circular stage was modified and used with a vertical Abbe-type length meter as the instrument stage. Figures 5, no references.

2542
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UDC: 681.26-523.8:681.32-.32-181.48:681.326

MIXING-WEIGHING SYSTEM WITH MICROPROCESSOR FOR THE CONTROL OF INDUSTRIAL PROCESSES

Budapest MERES ES AUTOMATIKA in Hungarian Vol 29 No 8, 1981 pp 293-296

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[Abstract] The design, construction, operation and performance of a mixing-weighing system developed jointly by the Research Institute of the Instrument Industry and MATRIPOND Scale Factory is described and illustrated with photographs, performance tables, and displays. The measuring range is 1 kg to 1,000 tons, the resolution is up to 50,000, the accuracy is up to 5,000 d (OIML Class III), the linearity error is 0.005 percent, the temperature dependence is 0.003 percent and the sensitivity is 0.005 percent over the full temperature range, the operating-temperature range is -20°C to +50°C for the transducer and analog-to-digital converter and 0°C to +50°C for the central processor unit. Mechanical interferences are suppressed, the equipment is insensitive to electrical interferences, many measuring locations are possible, the measuring locations can be automatically selected, there is automatic dribbling correction and automatic mixing-formula correction, and the commands, modes and readings are displayed. The unit, called Tensimink, is compared to commercial brands (Schenck, Bofors, Philips, Howe Richardson, Toledo, Streeter Amet, and ISCA Electronics). An installed system, used in an animal-feed blending station, is described. It operates in manual, formula-entry, and automatic mode, and its performance is satisfactory. Figures 5, references 5: 2 Russian and 3 Polish.

2542
CSO: 2502/13

MANUAL AND AUTOMATIC CHECKING OF PHOTOMASKS AND SEMICONDUCTOR WAFERS PART 2

Budapest FINOMMECHANIKA MIKROTECHNIKA in Hungarian Vol 20 No 8, Aug 81
pp 234-243, BIII

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[Abstract] Equipment used to check photomasks and semiconductor wafers manually and automatically is reviewed, and the advantages, disadvantages, and application areas of the various types of instrument are discussed. Manual instruments for checking the absolute and relative dimensions of photomasks include optical microscopes with eyepiece for absolute dimensions and comparator microscopes for relative dimensions. Relative dimensions can also be checked with microscopes featuring split imaging, television display, projector, and/or digital display with and without filters or holographic subtractors. Automated checking of photomasks can be accomplished with microdensitometric instruments, television micrometers, and oscillating-mirror instruments. Random photomask defects are determined by optical image comparison, television microscopes, optical filters, and dual-beam scanning. The operating principles of the various types of equipment are illustrated with drawings and the major performance characteristics of commercial instruments (Leitz Metalloplan HL 6" x 6", Vickers Photoplan M51, Romiscope, Leitz Latimet, Leitz Comparator 200 Digital, Leitz MVG 5" x 5", and experimental units from the United States and Hungary) are presented in tabular form. Figures 17, tables 2, references 11: 4 German, 1 Hungarian and 6 Western.

2542
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DESIGN AND CONSTRUCTION OF A LIGHT-DENSITY METER FOR TESTING OF DISPLAYS

Budapest HIRADASTECHNIKA in Hungarian Vol 32 No 9, 1981 pp 325-329; manuscript received 14 January 1981

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[Abstract] The instrument described was developed for measuring the light density of seven-segment numerical displays based on vacuum fluorescence, developed for the United Incandescent Lamp and Electrical Company. The light density of the Type DTM 208R displays is measured as a function of individual parameters such as heating current, anode voltage and grid voltage. The photodetector used features a Darlington type photodiode and transistor in a common circuit. The photodiode used was a BPW 30, made by Telefunken. Two versions were first prepared; one used a single BPW 30, the other used three. Adaptation to the spectral characteristics of the human eye was accomplished with appropriate Schott filters. The electronic recording units of the light-density meter included the temperature regulator for the detector casing, the DC amplifier, the integrator and the power-supply assembly. The instrument displays voltage in proportion to the light density via a digital voltmeter connected to the integrator output. It is calibrated with a precision light-density meter equipped with a Spectra Pritchard photoelectron multiplier. The instrument provides adequately accurate readings. Schematic diagrams, block diagrams, and performance diagrams are presented. Figures 7, tables 2, references 8: 1 German and 7 Hungarian.

2542
CSO: 2502/11

SCIENTIFIC SHORTCOMINGS, REFORM ASSESSED

Warsaw TRYBUNA LUDU in Polish 6 Nov 81 p 3

[Article by Tomasz Miecik: "All, That Is, No One: Science Also Needs Reform"; passages enclosed in slantlines printed in boldface]

> [Text] /For many years in the past all scientists were supposed to help the nation's economy and development. All, that is, no one. Every gathering of scientists--from national congresses to provincial conferences--was decorated with the slogan "Science in the Service of the Economy." Some are aware how poorly this has served science, but all can see for themselves how poorly this has served the economy./

Years ago a highly respected scientist confided in me that for the remainder of his life every night in his dreams he would be haunted by the insistent question posed to every researcher: "And what is it for? What will the benefits be?"

There are many definitions of scientific activity. There is the definition that it consists in searching for answers to questions which no one yet has answered, upon employing techniques that demonstrate the correctness of the answer--this being the simplest definition, which has not sounded too convincing to the [political] decisionmakers. Hence, additional questions were formulated--questions whose number as well as content could indeed cause nightmares.

For the sake of fairness let us admit that these questions were not always unjustified. This is admitted, besides, by scientists themselves. Prof Dr Jozef Smigielski wrote: "Disappointments, loss of trust in science, and society's attempts to extend its control to the scientific community are fully justified since that community has not set up its own effective system of self-control, and in particular was unable to rid itself of the harmful ballast of pseudo-scientists and careerists who are numerically dominant and adversely affect the overall consequences. According to N. Wiener, 95 percent of all worthwhile results of scientific activity is accomplished by 5 percent of all scientists. Under such conditions what is left is demanding of the scientific community that it take an active part in activities that are of direct use to the economy and whose effects are more measurable, in the expectation that this will not suppress the activities of the most creative individuals who are oriented by intellectual rather than material considerations."

The time of great stock-taking is coming in science just as in the nation as a whole. Several decrees of tremendous importance to the scientific community (among others, a decree on scientific degrees and titles) are being drawn up. It can be justifiably hoped that they will contribute to a more efficient screening of undesirables in that community and that they will bar the way to scientific careers for individuals who are unfit for this extremely exacting work. Thus perhaps with time the scientific community will gain greater trust and the criterion of the economic utility of all scientific research projects will lose its monopoly position?

As part of this stock-taking it might be desirable to put forward a postulate that is after all not too immodest: it would be good if, in science as in any other domain of socio-economic life, if everyone were to do his job. This old and simple idea requires, though, some clarification.

Thus, e.g. the basic obligations of higher schools are, in this order: instruction, the training of new scientists, and the conduct of research. Thus, this is formulated in the 1972 "Charter of the Teacher's Rights and Duties." In reality, however, during the past decade, many research and instruction institutes have given priority to cooperation in developing technical progress. A common practice, in this connection, has been the implementation of easy--and hence lucrative--research orders. It is truly said that where research is of low quality, instruction is of low quality too. These research projects, commissioned by industry can hardly be regarded as challenging. It is difficult to determine how they have benefited industry, but it is easy to see that the quality of instruction has markedly declined.

Let us explore this situation further. As is known, institutes of the PAN [Polish Academy of Sciences] are chiefly supposed to conduct basic research into the processes occurring in nature and society, to determine the laws governing these processes and to account for them with the aid of hypotheses and theories. Yet some of these centers engage in production and services instead of in long-range basic conceptual and intellectual research. The demands for engaging in these applied activities, addressed to those institutes, can be explained only by their inability to carry out their proper tasks.

At even the leading institutes of the PAN it has become a nearly universal practice to accept commissions from factories or [industry] associations and to supplant research laboratories with service-providing workshops. It is thus no surprise that at the last session of the PAN's General Assembly it was demanded that the Academy should rather concern itself with scientific research. Certainly, the Academy should be ready to satisfy economic needs in especially important cases, but only if those needs are truly important and serious.

Applied research should be performed by the properly designated institutions of the economy, OBR [research and development centers, and research and development institutes, including the ministerial institutes. That network of applied research institutions employs nearly one-half million people including much valuable scientific personnel and its facilities are relatively well-equipped, etc. Why then is that network performing so poorly?

There is no single answer to this question.

First, owing to the low demand for innovation, due to the inefficient economic mechanisms, the research and development institutions have been trapped in a vicious circle. The activities of some became divorced from industry--their natural turf--while the activities of others became too closely related to industry, so much that it has absorbed them and transformed them into administrative departments. This process has led to the disappearance of many research and development centers during the second half of the 1970s.

Second, research and development centers employ too few scientists. E.g. the so-called scientific research workers account for only 2.8 percent of the personnel of the OBR. These centers were intended to relieve the large institutes dealing with key problems of the economy to handle minor research projects for enterprises, associations, and ministries. This has not happened owing to the shortage of scientific personnel at the OBR. It may be that scientists were not recruited with sufficient zeal for these centers and that their importance was underestimated by the heads of these centers--mainly functionaries of the economic management who were not scientists themselves.

Third, the R&D network has not been assigned precisely defined tasks. This was because industry was not sure of its aims and lost its way in the intricacies of economic and, especially, technical policy. No one knew what the aims or what the means of achieving them were, nor what one should do or what had to be acquired from the abroad. Compared with such a mess, a lesser evil was that industry lacked programming and forecasting services capable of properly formulating the tasks of science.

Fourth, the R&D facilities became a link in the chain of absurdities in which everyone did everything except his own duties. Thus, the technician performed the duties of a skilled worker, the engineer--the duties of the technician, and so on. R&D centers work to a large extent on topics which should be handled by the engineer personnel of the work establishments. It is thus not surprising in that the tasks proper of the OBR are being performed by, e.g., ministerial, educational, or PAN institutes. They do not perform them well, besides, because they may be familiar with research work but, unlike the R&D centers serving industry, their understanding of the realities of industry is foggy.

And so we have explored the gist of the matter, the principal cause of most of the defeats suffered by both science and the economy in the past years. The most important government and interministerial research programs have been implemented sloppily because the laboratories established for this purpose have instead became preoccupied with topics which should properly have been resolved by in-plant engineers and technicians. As for the in-plant engineers, it is known that they not only perform the duties of technicians but also those of secretaries, typists, draftsmen, file clerks, information personnel, and even messengers.

It can be hoped that this situation will be brought to an end by the economic reform. However, so far little has been said [about reform] in the area of research. And yet this is precisely where the situation practically cries out for a reform. This is necessary for the good of both the "greater" science working for the future needs of society and contributing to the common fund of human knowledge, and the applied science serving to meet the current needs of development.

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